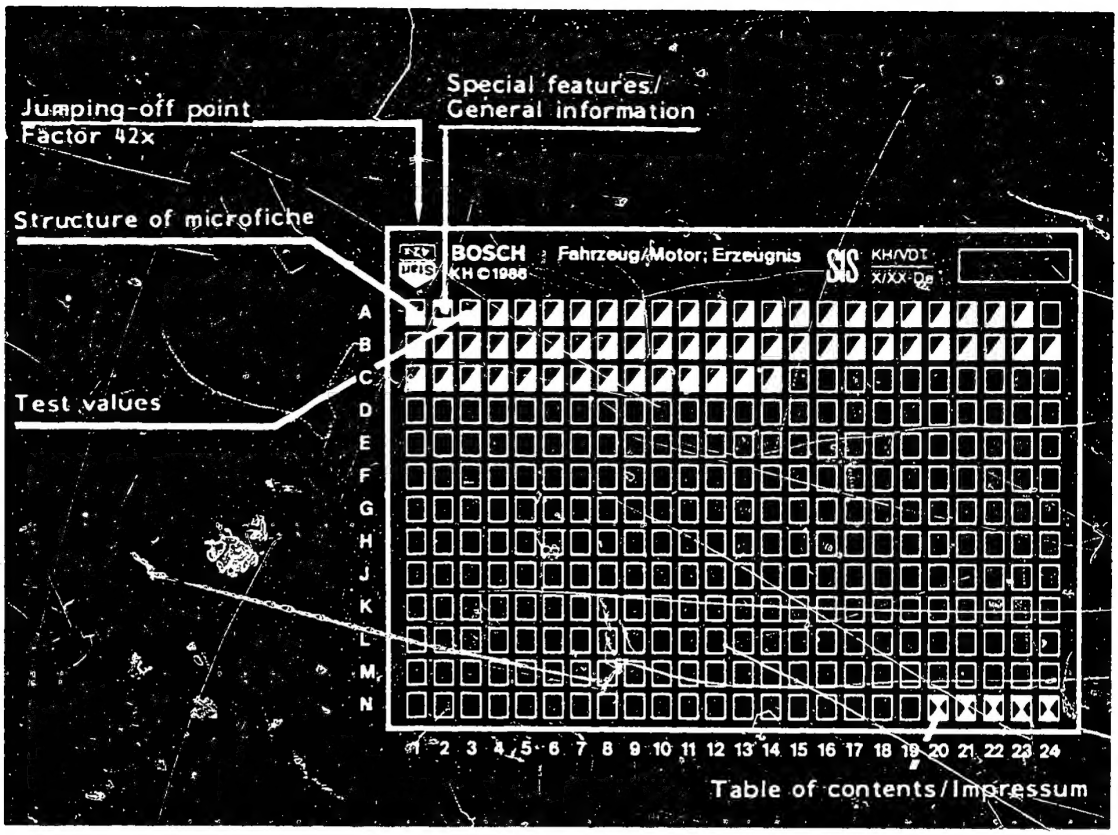
## Structure of microfiche




1. Read from left to right

2. Title of microfiche (appears on each coordinate)

| E16 | Product/assembly/test step<br>Vehicle/engine | |
|---|---|---|

Coordinate

3. Limits of section

| Beginning | Mid-section | End | One-page section |
|---|---|---|---|

## 1. Special features

This microcard contains test specifications for starting motors (0 001 ...). The output information in kW refers to the maximum permitted vehicle battery size, 3/4 charged.
The part numbers of the starting motors are initially arranged in rising numerical order. They are listed later in unsorted sequence.
The desired starting motors and their test specifications can now be found only with the revised microcard "STARTING MOTORS - Listing of test specifications "W-001/1000

## 2. General information

The test specifications listed in this microcard refer to testing with 2 x 143 Ah batterys (parallel connected).
The batterys used for testing must be 3/4 charged.

Use the most suitable clamping flange for testing starting motors.

If no suitable clamping flange is available, an available clamping flange must be adapted to the starting motor.

Test benches used: EFAL 140
EFAL 152/153
KPS 002

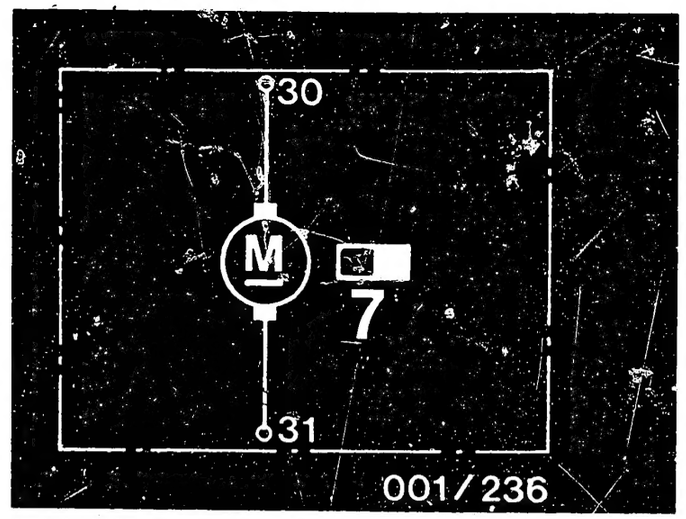
In order to prevent damage to smaller starting motors in testing, such starters are tested using a series resistor of 10 mΩ.
Connection term. 30/2 on test bench EFAL 152/153 or separate series resistor, part no. 1 684 530 109
Torque information only with test benches having torque-measuring device.

Further information:

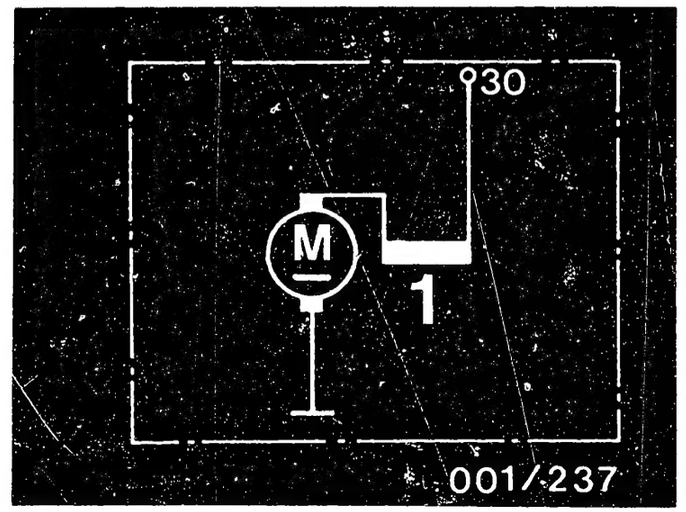
Starting-motor repair instructions, motor-vehicle electric specifications.

| Part no. | | 0 001 000 .. 050 .. | 0 001 001 .. | 0 001 100 .. | | 0 001 101 .. | |
|---|---|---|---|---|---|---|---|
| Previous type code | | CB 12V 0.15 kW | CB 12V 0.3 kW | CD 0.3/6 | | CD 0.4/6 | |
| Idle | V | 12 | 12 | 5.5 | | 5.5 | |
| | < A | 7 | 50 | 65 | | 70 | |
| | > $min^{-1}$ | 4200 | 9500 | 6000 | | 6000 | |
| Short circuit[1]) | V | 8 | 6 | 3 | 2.5 | 2.5 | 2 |
| | A | 60 ... 75 | 200 ... 250 | 250... 340 | 200... 290 | 270... 360 | 210... 290 |
| Torque | > Nm | - | - | 2.9 | 2.4 | 3.8 | 3.0 |
| Minimum voltage for solenoid switch | V | - | - | - | | - | |
| Commutator dia. new | mm | 23 | 23 | 33 | | | |
| minimum | mm | 22.5 | 22.5 | 31.2 | | | |
| Brush press. | N | 1.8...2.2 | 3.8...5.4 | 5.5...7.0 | | | |
| Carbon-brush minimum length | mm | 7.5 | 5 | 11.5 | | | |
| Setting "a" relay | mm | - | - | - | | | |
| Burn-off reserve | mm | - | - | 1 | | | |
| Armature longitudinal clearance | mm | 0.1 ... 0.3 | 0.05 ... 0.2 | 0.05...0.3 | | | |
| Armature braking torque | Nm | 0.02 ... 0.03 | 0.05 ... 0.1 | 0.24...0.4 | | | |
| Overrunning torque, overrunning clutch | Nm | - | 0.14 ... 0.22 | 0.06...0.1 [1]<br>0.14...0.22 [2] | | | |
| Backlash of teeth | mm | approx 0.2 | 0.3 ... 0.6 | 0.3 ... 0.6 | | | |
| Pinion clearance | mm | 1.5 ... 2.5 | 1.5 ... 2.5 | 2.0 ... 3.0 | | | |

1) Inner overrunning-clutch drive 2) Outer overrunning-clutch drive

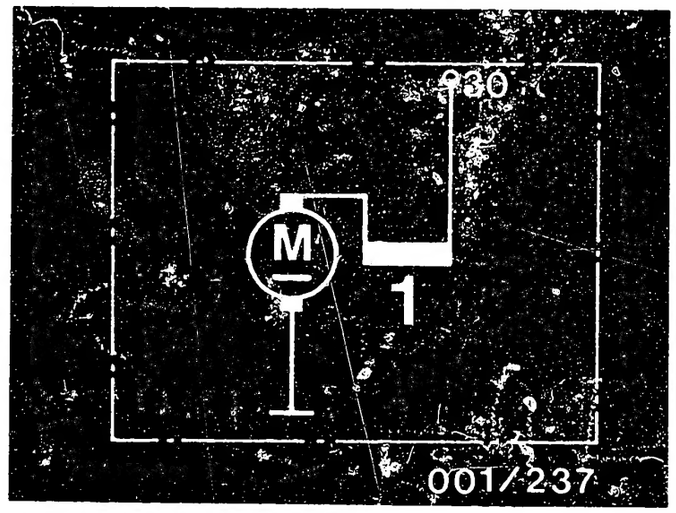



1 = Series winding
7 = Permanent magnet

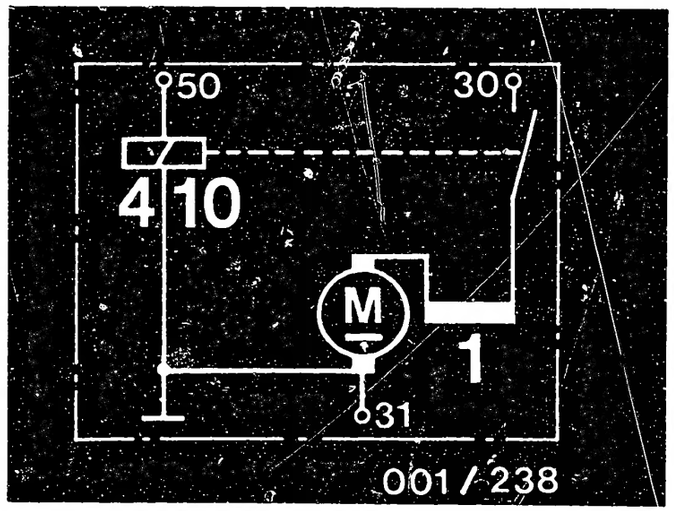


| Part no. | | 0 001 102 .. | | 0 001 103 .. | | 0 001 104 .. | |
|---|---|---|---|---|---|---|---|
| Previous type code | | CD 0.5/12 | | DD 6V 0.3 kW | | DD 6 V 0.4 kW | |
| Idle | V | 11.5 | | 5.5 | | 5.5 | |
| | < A | 40 | | 85 | | 65 | |
| | > $min^{-1}$ | 6500 | | 6000 | | 7000 | |
| Short circuit | V | 9 | 8 | 3.5 | 3 | 3.5 | 3 |
| | A | 260... 350 | 220... 310 | 280... 370 | 230... 320 | 370... 470 | 310... 400 |
| Torque | > Nm | 8.8 | 7.8 | 3.7 | 3.2 | 5.7 | 4.9 |
| Minimum voltage for solenoid switch | V | - | | 3.5 | | 3.5 | |
| Commutator dia. new | mm | 33 | | | | | |
| Commutator dia. minimum | mm | 31.2 | | | | | |
| Brush press. | N | 5.5 ... 7.0 | | | | | |
| Carbon-brush minimum length | mm | 11.5 | | | | | |
| Setting "a" relay | mm | - | | 26.7 ± 0.1 | | | |
| Burn-off reserve | mm | 1 | | | | | |
| Armature longitudinal clearance | mm | 0.05 ... 0.3 | | | | | |
| Armature braking torque | Nm | 0.24 ... 0.4 | | | | | |
| Overrunning torque, overrunning clutch | Nm | 0.06...0.1 1)<br>0.14...0.22 2) | | | | | |
| Backlash of teeth | mm | 0.3 ... 0.6 | | | | | |
| Pinion clearance | mm | 2.0 ... 3.0 | | | | | |

1) Inner overrunning-clutch drive
2) Outer overrunning-clutch drive

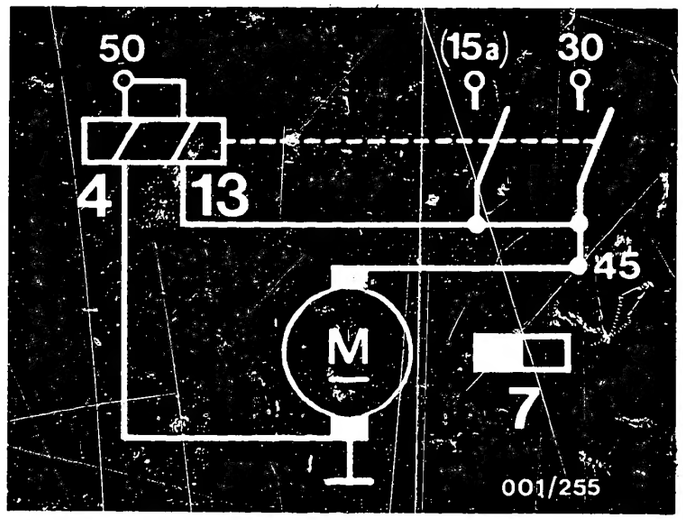



1 = Series winding
4 = Holding winding
10= Solenoid switch with/without insulated terminal 31

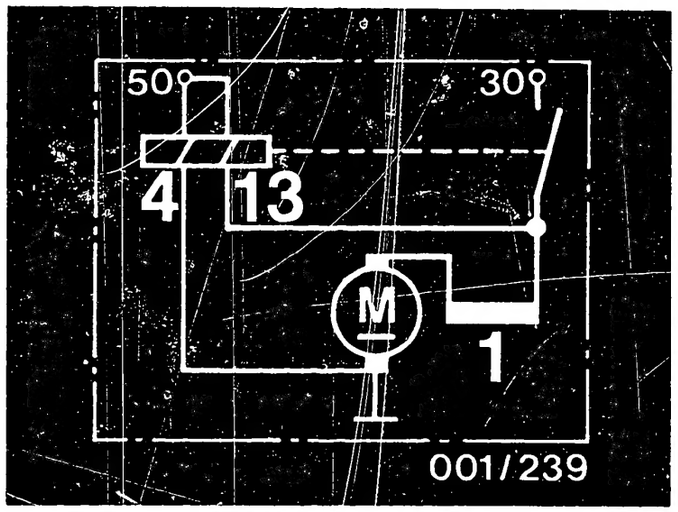


| Part no. | | 0 001 108 .. 3 | | 0 001 110 .. 3) | | 0 001 154 .. | | 0 001 155 | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | DW 12V 1.4 kW | | DW 12V 1.7 kW | | DD 6V 0.4 kW | | DD 12V 0.5 k | |
| Idle | V | 11.5 | | 11.2 | | 5.5 | | 11.5 | |
| | < A | 75 | | 95 | | 65 | | 40 | |
| | > $min^{-1}$ | 2900 | | 2800 | | 7000 | | 6500 | |
| Short circuit | V | 3.5 | 4.5 | 3.8 | 3 | 3.5 | 3 | 9 | 8 |
| | A | 475... 600 | 625... 800 | 650... 840 | 510... 660 | 370... 470 | 310... 400 | 260... 340 | 230... 310 |
| Torque | > Nm | 12.5 | 16 | 17.5 | 14 | 5.7 | 4.9 | 8.8 | 7.8 |
| Minimum voltage for solenoid switch | V | 8 | | 8 | | 3.5 | | 8.0 | |
| Commutator dia. | | | | | | | | | |
| | new mm | 32.3 | | 32.3 | | 33 | | 33 | |
| | minimum mm | 31.2 | | 31.2 | | 31.2 | | 31.2 | |
| Brush press. | N | - | | - | | 8.0 ... 9.0 | | 8.0 ... 9.0 | |
| Carbon-brush minimum length | mm | 4.5 | | 6.0 | | 11.5 | | 11.5 | |
| Setting "a" relay | mm | - | | - | | 39 ± 0.1 | | 37 ± 0.1 | |
| Burn-off reserve | mm | - | | - | | 0.9 ... 1.5 | | 0.7 ... 1.5 | |
| Armature longitudinal clearance | mm | 0.05 ... 0.4 | | 0.05 ... 0.4 | | 0.1 ... 0.3 | | 0.1 ... 0.3 | |
| Armature braking torque | Nm | 0.9 ... 1.4 | | 0.9 ... 1.5 | | 0.24 ... 0.4 | | 0.24 ... 0.4 | |
| Overrunning torque, overrunning clutch | Nm | 0.12 ... 0.18 | | 0.12 ... 0.18 | | 0.06...0.1 1) 0.14...0.22 2) | | 0.14 ... 0.22 | |
| Backlash of teeth | mm | 0.3 ... 0.6 | | 0.3 ... 0.6 | | 0.3 ... 0.6 | | 0.3 ... 0.6 | |
| Pinion clearance | mm | 2.0 ... 3.0 | | 2.0 ... 3.0 | | 2.0 ... 3.0 | | 2.0 ... 3.0 | |

1) Inner overrunning-clutch drive
2) Outer overrunning-clutch drive
3) Testing only with 10 mΩ series resistor. Note: Do not operate 12 V starting motor (DW) with 24 V; starting motor would be destroyed.

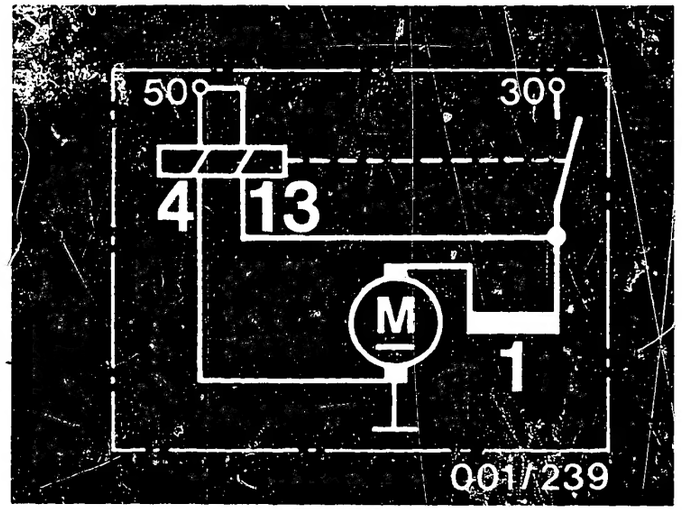



1 = Series winding
4 = Holding winding
7 = Permanent magnet
13= Pull-in winding

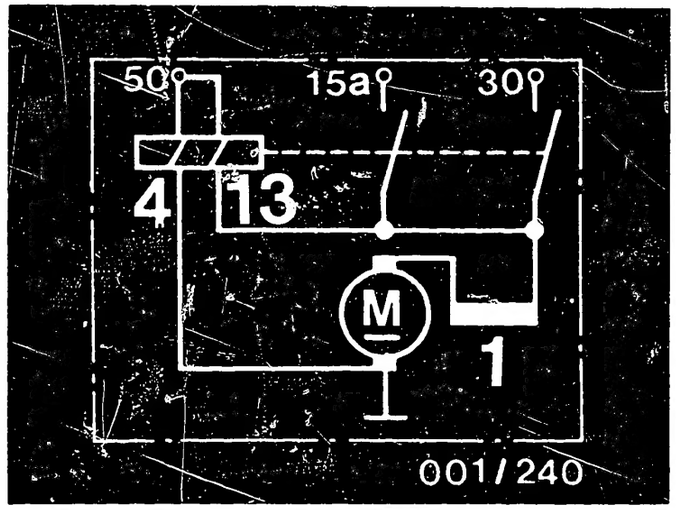


| Part no. | | 0 001 157 001 up to 009 | | 0 001 157 012 up to 024 | | 0 001 157 022 | | 0 001 158 .. | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | DF 12V 0.6 kW | | DF 12V 0.7 kW | | DF 12V 0.6 kW | | DD 12V 0.4 kW | |
| Idle | V | 11.5 | | 11.5 | | 11.5 | | 11.5 | |
| | ≤ A | 40 | | 50 | | 50 | | 55 | |
| | > $min^{-1}$ | 6500 | | 7500 | | 8000 | | 9000 | |
| Short circuit | V | 8 | 7 | 8 | 7 | 8 | 7 | 8 | 7 |
| | A | 345... 425 | 300... 380 | 380... 460 | 325.. 400 | 290... 360 | 260... 330 | 320... 410 | 270... 360 |
| Torque | > Nm | 9.95 | 8.74 | 10 | 8.6 | 7.3 | 6.4 | 8.0 | 7.0 |
| Minimum voltage for solenoid switch | V | 8.0 | | | | | | 8.0 | |
| Commutator dia. | | | | | | | | | |
| | new mm | 33 | | | | | | 32.7 | |
| | minimum mm | 31.2 | | | | | | 31.2 | |
| Brush press. | N | 8.0 ... 9.0 (14.5...16.0) | | | | | | 8.0 ... 9.0 | |
| Carbon-brush minimum length | mm | 11.5 | | | | | | 11.5 | |
| Setting "a" relay | mm | 12 ± 0.1 (17.5 ± 0.15) | | | | | | 37 ± 0.1 | |
| Burn-off reserve | mm | 0.7 ... 1.5 | | | | | | 0.9 ... 1.5 | |
| Armature longitudinal clearance | mm | 0.05 ... 0.3 | | | | | | 0.1 ... 0.3 | |
| Armature braking torque | Nm | 0.24 ... 0.4 | | | | | | 0.24 ... 0.4 | |
| Overrunning torque, overrunning clutch | Nm | 0.14 ... 0.22 | | | | | | 0.14 ... 0.22 | |
| Backlash of teeth | mm | 0.3 ... 0.6 | | | | | | 0.3 ... 0.6 | |
| Pinion clearance | mm | 2.0 ... 3.0 | | | | | | 2.0 ... 3.0 | |

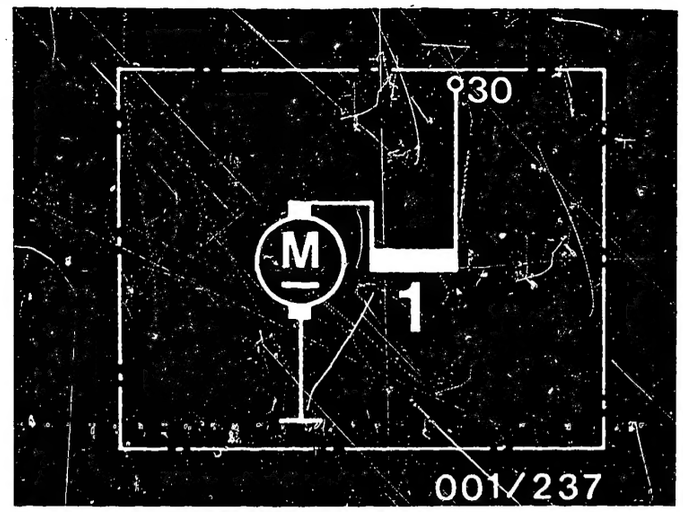
Values in parentheses apply only to 0 001 157 009; .. 012, .. 013



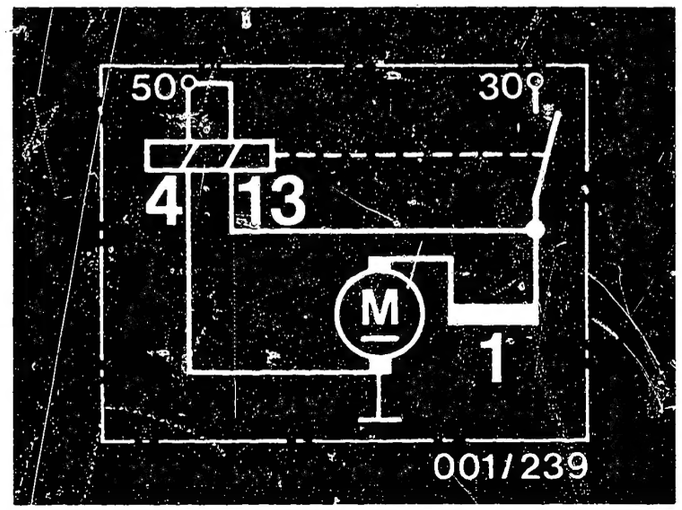

1 = Series winding
4 = Holding winding
13= Pull-in winding



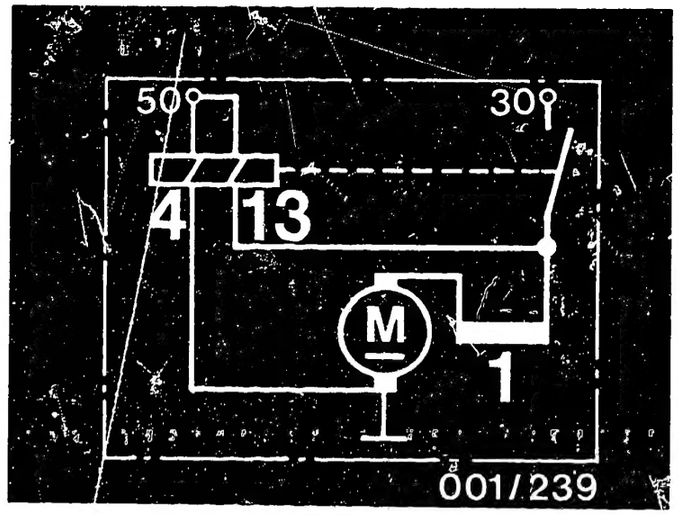
| Part no. | | 0 001 160 .. | | 0 001 201 .. | | 0 001 203 .. (with 4 carbon brushes) | | 0 001 203 .. (with 5 carbon brushes) | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | BG 12V 0.65 kW | | ED 6V 0.4 kW | | E 12 V 0.8 kW | | | |
| Idle | V | 11.5 | | 5.5 | | 11.5 | | 11.5 | |
| | < A | 55 | | 75 | | 50 | | 50 | |
| | > $min^{-1}$ | 9000 | | 5500 | | 5800 | | 4500 | |
| Short circuit | V | 8.5 | 7.5 | 3 | 2.5 | 9 | 8 | 9 | 8 |
| | A | 340... 430 | 300.. 390 | 300... 390 | 240.. 330 | 290... 380 | 250... 340 | 330... 420 | 290... 380 |
| Torque | > Nm | 8.0 | 7.0 | 5.5 | 4.5 | 13.5 | 12 | 13.5 | 12 |
| Minimum voltage for solenoid switch | V | 8.0 | | 3.5 | | 8.0 | | 8.0 | |
| Commutator dia. | | | | | | | | | |
| | new mm | 32.7 | | 36 | | | | | |
| | minimum mm | 31.2 | | 33.5 | | | | | |
| Brush press. | N | 14.5 ... 16.0 | | 8 ... 9 | | | | | |
| Carbon-brush minimum length | mm | 11.5 | | 17 | | | | | |
| Setting "a" relay | mm | - | | 32.2 ± 0.1 | | | | | |
| Burn-off reserve | mm | - | | 0.9 ... 1.5 | | | | | |
| Armature longitudinal clearance | mm | 0.05 ... 0.2 | | 0.1 ... 0.3 | | | | | |
| Armature braking torque | Nm | 0.12 ... 0.17 | | 0.3 ... 0.6 | | | | | |
| Overrunning torque, overrunning clutch | Nm | 0.14 ... 0.22 | | 0.06 ... 0.1 | | | | | |
| Backlash of teeth | mm | 0.3 ... 0.6 | | 0.3 ... 0.6 | | | | | |
| Pinion clearance | mm | 2.0 ... 3.0 | | 2.0 ... 3.0 | | | | | |




1 = Series winding
4 = Holding winding
13= Pull-in winding



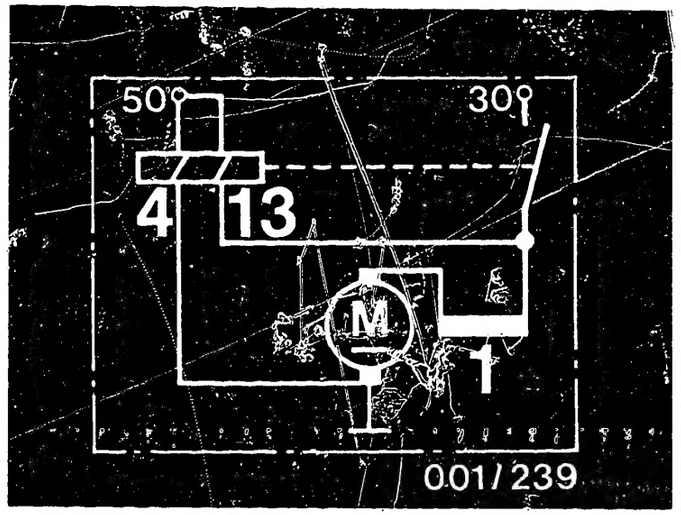
| Part no. | | 0 001 204 .. | | 0 001 205 .. | | 0 001 206 .. | | 0 001 207 .. | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | ED 24 V 0.9 kW | | ED 6V 0.5 kW | | EED 0.8/2 | | EF 6V 0.5 kW | |
| Idle | V | 23.5 | | 5.5 | | 11.5 | | 5.5 | |
| | < A | 30 | | 75 | | 50 | | 70 | |
| | > $min^{-1}$ | 6800 | | 4500 | | 5800 | | 5500 | |
| Short circuit | V | 21 | 20 | 2.5 | 2.0 | 9 | 8 | 2.5 | 2.0 |
| | A | 190... 260 | 180... 250 | 300... 390 | 230... 320 | 290... 380 | 250... 340 | 300... 380 | 230... 320 |
| Torque | > Nm | 22 | 20 | 6.5 | 5.0 | 12.5 | 11 | 6.5 | 5.0 |
| Minimum voltage for solenoid switch | V | 17 | | 3.5 | | 8.0 | | 3.5 | |
| Commutator dia. | | | | | | | | | |
| | new mm | 36 | | 36 | | 36 | | 35.3 | |
| | minimum mm | 33.5 | | 33.5 | | 33.5 | | 33.5 | |
| Brush press. | N | 8 .. 9 | | 8 ... 9 | | 8 ... 9 | | 8 ... 9 | |
| Carbon-brush minimum length | mm | 17 | | 17 | | 13 | | 13 | |
| Setting "a" relay | mm | 42.2 ± 0.1 | | 32.2 ± 0.1 | | 32.2 ± 0.1 | | 32.2 ± 0.1 | |
| Burn-off reserve | mm | 0.9 ... 1.5 | | 0.9 ... 1.5 | | 0.9 ... 1.5 | | 0.7 ... 1.5 | |
| Armature longitudinal clearance | mm | 0.1 ... 0.3 | | 0.1 ... 0.3 | | 0.1 ... 0.3 | | 0.1 ... 0.3 | |
| Armature braking torque | Nm | 0.3 ... 0.6 | | 0.25 ... 0.5 | | 0.3 ... 0.6 | | 0.25 ... 0.4 | |
| Overrunning torque, overrunning clutch | Nm | 0.06 ... 0.1 | | 0.14 ... 0.22 | | 0.06 ... 0.1 | | 0.14 ... 0.22 | |
| Backlash of teeth | mm | 0.3 ... 0.6 | | 0.3 ... 0.6 | | 0.3 ... 0.6 | | 0.3 ... 0.6 | |
| Pinion clearance | mm | 2.0 ... 3.0 | | 2.0 ... 3.0 | | 2.0 ... 3.0 | | 2.0 ... 3.0 | |




1 = Series winding
4 = Holding winding
13= Pull-in winding

| Part no. | | 0 001 208 ... | | 0 001 208 2.. | | 0 001 208 4.. ... 208 5.. | | 0 001 209 ... | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | EF 12V 0.85 kW | | EF 12 V 0.85 kW | | EF 12V 0.95 kW | | EF 6V 0.45 kW | |
| Idle | V | 11.5 | | 11.5 | | 11.5 | | 5.5 | |
| | < A | 55 | | 55 | | 55 | | 70 | |
| | > $min^{-1}$ | 6000 | | 7000 | | 7000 | | 5500 | |
| Short circuit | V | 8.5 | 7.5 | 7.7 | 6.0 | 7.7 | 6.0 | 2.5 | 2.0 |
| | A | 320... 420 | 280... 370 | 400... 500 | 300... 390 | 450... 570 | 350... 450 | 260... 350 | 200... 280 |
| Torque | > Nm | 12.5 | 11 | 13 | 11 | 13 | 11 | 5 | 4 |
| Minimum voltage for solenoid switch | V | 8.0 | | 8.0 | | 8.0 | | 3.5 | |
| Commutator dia. new | mm | 36 | | | | | | 36 | |
| minimum | mm | 33.5 | | | | | | 33.5 | |
| Brush press. | N | 11.5 ... 13.5 | | | | (14.5...17)[4] | | 11.5 ... 13.5 | |
| Carbon-brush minimum length | mm | 13 | | | | | | 13 | |
| Setting "a" relay | mm | (16 ± 0.15)[1] | | 28.5 ± 0.2 | | (19 ± 0.15)[2] | | 19 ± 0.15 | |
| Burn-off reserve | mm | 0.8 ... 1.2 | | | | (0.7 ... 1.5)[3] | | 0.7 ... 1.5 | |
| Armature longitudinal clearance | mm | 0.05 ... 0.3 | | | | | | 0.1 ... 0.3 | |
| Armature braking torque | Nm | 0.25 ... 0.4 | | | | | | 0.17 ... 0.33 | |
| Overrunning torque, overrunning clutch | Nm | 0.14 ... 0.22 | | | | | | 0.14 ... 0.22 | |
| Backlash of teeth | mm | 0.3 ... 0.6 | | | | | | 0.3 ... 0.6 | |
| Pinion clearance | mm | 2.0 ... 3.0 | | | | | | 2.0 ... 3.0 | |

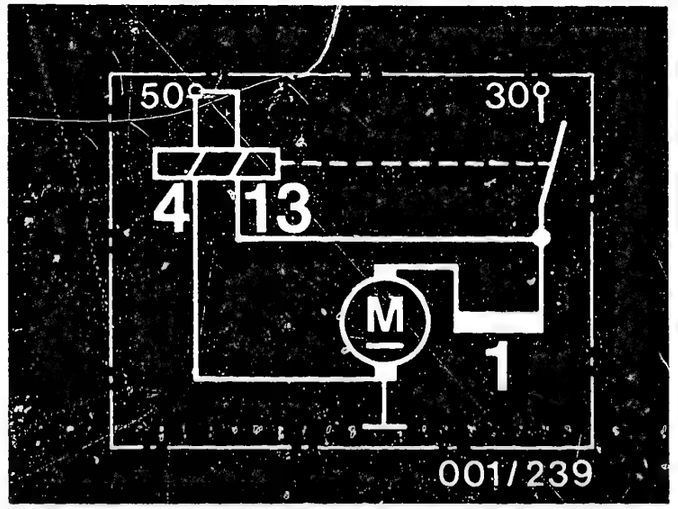
1) 0 001 208 051; 2) 0 001 208 058; 3) 0 001 208 051, .. 058; 4) 0 001 208 2.., 208 4..



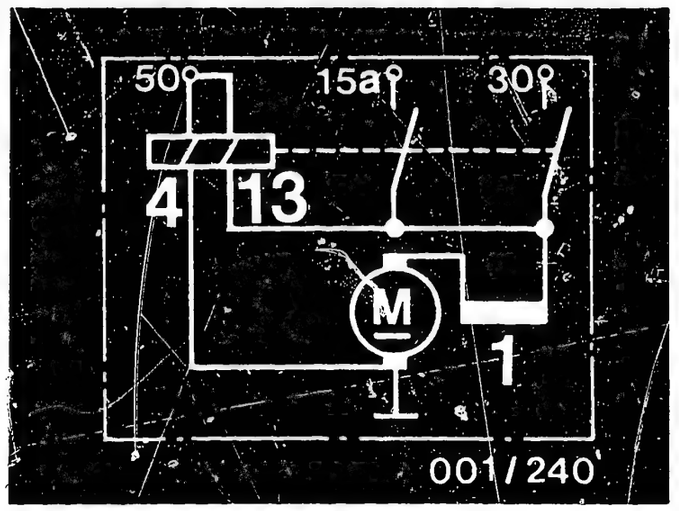

1 = Series winding
4 = Holding winding
13= Pull-in winding

| Part no. | | 0 001 211 .. | | 0 001 211 2.. | | 0 001 211 9.. | |
|---|---|---|---|---|---|---|---|
| Previous type code | | EF 12V 0.8 kW | | EF 12V 0.8 kW | | EF 12V 0.8 kW | |
| Idle | V | 11.5 | | 11.5 | | 11.5 | |
| | < A | 50 | | 58 | | 50 | |
| | > $min^{-1}$ | 6000 | | 7000 | | 6500 | |
| Short circuit | V | 9.0 | 8.0 | 8.5 | 7.5 | 8.5 | 7.5 |
| | A | 300...390 | 260...350 | 340...430 | 290...380 | 320...410 | 270...360 |
| Torque | > Nm | 12 | 10 | 12 | 10 | 11.5 | 10 |
| Minimum voltage for solenoid switch | V | 8.0 | | 8.0 | | 8.0 | |
| Commutator dia. | | | | | | | |
| | new mm | 36 | | | | | |
| | minimum mm | 33.5 | | | | | |
| Brush press. | N | 11.5 ... 13.5 | | | | | |
| Carbon-brush minimum length | mm | 13 | | | | | |
| Setting "a" relay | mm | 19 ± 0.15 | | | | (16 ± 0.15) 1) | |
| Burn-off reserve | mm | 0.7 ... 1.5 | | | | | |
| Armature longitudinal clearance | mm | 0.1 ... 0.3 | | | | | |
| Armature braking torque | Nm | 0.17 ... 0.33 | | | | (0.25...0.4) 1) | |
| Overrunning torque, overrunning clutch | Nm | 0.14 ... 0.22 | | | | | |
| Backlash of teeth | mm | 0.3 ... 0.5 | | | | | |
| Pinion clearance | mm | 2.0 ... 3.0 | | | | | |

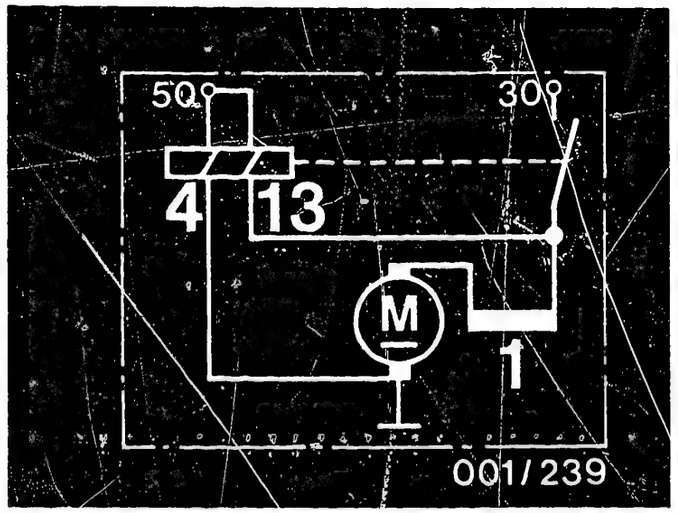
1) 0 001 211 2.., 0 001 211 9..




1 = Series winding
4 = Holding winding
13= Pull-in winding



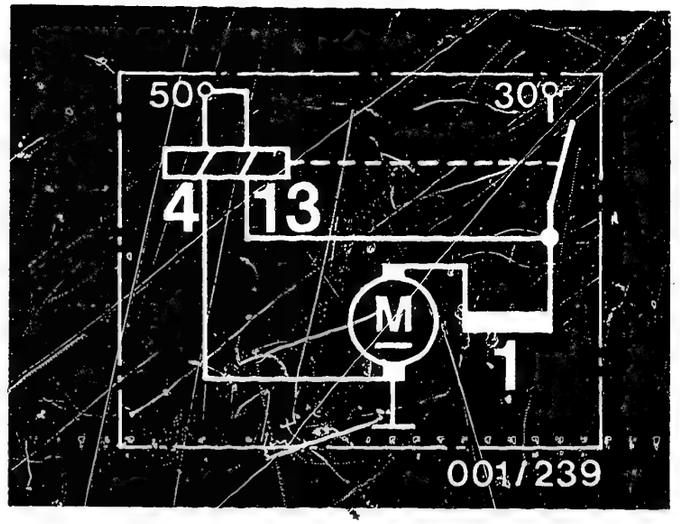
| Part no. | | 0 001 212 .. | | 0 001 212 2.. | | 0 001 213 .. | | 0 001 214 .. | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | EB 12 V 0.8 kW | | EB 12 V 0.8 kW | | EB 6V 0.5 kW | | EF 12V 0.9 kW | |
| Idle | V | 11.5 | | 11.5 | | 5 | | 11.5 | |
| | < A | 55 | | 55 | | 75 | | 65 | |
| | > $min^{-1}$ | 6000 | | 7000 | | 5000 | | 8000 | |
| Short circuit | V | 8.5 | 7.5 | 7 | 6 | 2.5 | 2.0 | 8 | 7 |
| | A | 320... 410 | 280... 370 | 300... 380 | 280... 350 | 290... 380 | 230... 320 | 400... 510 | 360... 460 |
| Torque | > Nm | 12.5 | 11 | 7.5 | 6.5 | 6.5 | 5 | 12 | 10 |
| Minimum voltage for solenoid switch | V | 8.0 | | 8.0 | | 3.5 | | 7.5 | |
| Commutator dia. new | mm | 36 | | | | 35.3 | | 35.3 | |
| minimum | mm | 33.5 | | | | 33.5 | | 33.5 | |
| Brush press. | N | 11.5 ... 13.5 | | | | 11.5 ... 13.5 | | 11.5 ... 13.5 | |
| Carbon-brush minimum length | mm | 13 | | | | 13 | | 13 | |
| Setting "a" relay | mm | 23 ± 0.15 | | | | 23 ± 0.15 | | 19 ± 0.15 | |
| Burn-off reserve | mm | 0.7 ... 1.5 | | | | 0.7 ... 1.5 | | 0.7 ... 1.5 | |
| Armature longitudinal clearance | mm | 0.1 ... 0.3 | | | | 0.1 ... 0.3 | | 0.1 ... 0.3 | |
| Armature braking torque | Nm | 0.35 ... 0.5 | | | | 0.35 ... 0.5 | | 0.35...0.5 | |
| Overrunning torque, overrunning clutch | Nm | 0.18 ... 0.25 | | | | 0.18 ... 0.25 | | 0.18 ... 0.25 | |
| Backlash of teeth | mm | 0.35 ... 0.6 | | | | 0.35 ... 0.6 | | 0.35 ... 0.6 | |
| Pinion clearance | mm | 2.0 ... 3.0 | | | | 2.0 ... 3.0 | | 2.0 ... 3.0 | |




1 = Series winding
4 = Holding winding
13= Pull-in winding

| Part no. | | 0 001 215 .. | | 0 001 218 ..[1] | | 0 001 304 .. | | 0 001 305 .. | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | EB 12V 1.3 kW | | EV 12V 2.2 kW | | GD 6V 0.6 kW | | GD 6V 0.5 kW | |
| Idle | V | 11.5 | | 10.5 | | 5.5 | | 11 | |
| | < A | 85 | | 160 | | 75 | | 50 | |
| | > $min^{-1}$ | 8500 | | 4200 | | 4000 | | 5500 | |
| Short circuit | V | 5.5 | 4.5 | 3.0 | 2.4 | 2.5 | 2 | 8.5 | 7.5 |
| | A | 620... 730 | 500... 610 | 720... 950 | 580... 750 | 290... 370 | 220... 300 | 360... 450 | 320... 400 |
| Torque | > Nm | 15 | 12.5 | 25 | 18 | 7 | 5.5 | 18 | 17 |
| Minimum voltage for solenoid switch | V | 7.5 | | 7.8 | | 3.5 | | 7.5 | |
| Commutator dia. | | | | | | | | | |
| | new mm | 36 | | 30.0 | | 35.3 | | 35.3 | |
| | minimum mm | 33.5 | | 28.9 | | 33.5 | | 33.5 | |
| Brush press. | N | 11.5 ... 13.5 | | - | | 9 ... 10.5 | | 9 ... 10.5 | |
| Carbon-brush minimum length | mm | 13 | | 7 | | 17 | | 17 | |
| Setting "a" relay | mm | 23 ± 0.15 | | - | | 32.2 ± 0.1 | | 32.2 ± 0.1 | |
| Burn-off reserve | mm | 0.7 ... 1.5 | | 0.8 ... 1.4 | | 0.9 ... 1.5 | | 0.9 ... 1.5 | |
| Armature longitudinal clearance | mm | 0.1 ... 0.3 | | 0.05 ... 0.3 | | 0.1 ... 0.3 | | 0.1 ... 0.3 | |
| Armature braking torque | Nm | 0.35 ... 0.5 | | 1.0 ... 1.5 | | 0.3 ... 0.5 | | 0.3 ... 0.5 | |
| Overrunning torque, overrunning clutch | Nm | 0.18 ... 0.25 | | 0.14...0.22 [2] 0.27...0.35 [3] | | 0.06 ... 0.1 | | 0.14 ... 0.22 | |
| Backlash of teeth | mm | 0.35 ... 0.6 | | - | | 0.3 ... 0.6 | | 0.3 ... 0.6 | |
| Pinion clearance | mm | 2.0 ... 3.0 | | - | | 2.0 ... 3.0 | | 2.0 ... 3.0 | |

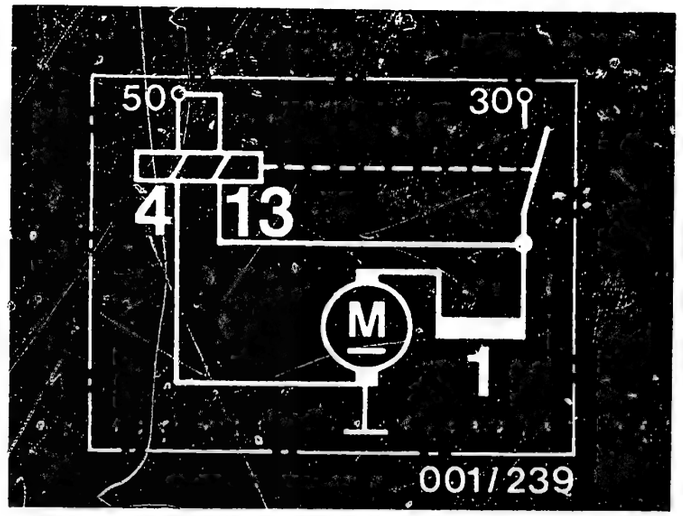
1) Test with 10 mΩ series resistor (connection term 30/2 with EFAL 152/153).
2) Overrunning clutch outside dia. 53.5
3) Overrunning clutch outside dia. 57.5 mm




1 = Series winding
4 = Holding winding
13= Pull-in winding

| Part no. | | 0 001 306 .. | | 0 001 307 .. | | 0 001 308 .. | | 0 001 308 1.. | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | GE 12V 1 kW | | GE 12V 1.3 kW | | GE 24V 1.4 kW | | GE 24V 1.8 kW | |
| Idle | V | 11.5 | | 11.5 | | 23.5 | | 23.5 | |
| | < A | 50 | | 70 | | 35 | | 50 | |
| | > $min^{-1}$ | 5500 | | 6300 | | 6000 | | 6000 | |
| Short circuit | V | 8.5 | 7.5 | 7 | 6 | 20 | 19.5 | 20 | 19 |
| | A | 360... 450 | 320... 400 | 500... 610 | 430... 530 | 230... 320 | 210... 300 | 310... 400 | 300... 380 |
| Torque | > Nm | 18 | 17 | 22 | 18.5 | 22 | 21 | 26 | 25 |
| Minimum voltage for solenoid switch | V | 7.5 | | 7.5 | | 15 | | 15 | |
| Commutator dia. | | | | | | | | | |
| | new mm | 36 | | 36 | | 36 | | | |
| | minimum mm | 33.5 | | 33.5 | | 33.5 | | | |
| Brush press | N | 9 ... 10.5 | | 9 ... 10.5 (13 ... 15) [1] | | 9 ... 10.5 | | | |
| Carbon-brush minimum length | mm | 17 | | 17 | | 17 | | | |
| Setting "a" relay | mm | 32.2 ± 0.1 | | 32.2 ± 0.1 (34 ± 0.1) [1] | | 42 ± 0.1 | | | |
| Burn-off reserve | mm | 0.9 ... 1.5 | | 0.9 ... 1.5 (0.9...1.6) [1] | | 0.9 ... 1.5 | | | |
| Armature longitudinal clearance | mm | 0.1 ... 0.3 | | 0.1 ... 0.3 | | 0.1 ... 0.3 | | 0.05...0.3 | |
| Armature braking torque | Nm | 0.3 ... 0.5 | | 0.3 ... 0.5 | | 0.3 ... 0.5 | | | |
| Overrunning torque, overrunning clutch | Nm | 0.14 ... 0.22 | | 0.26 ... 0.32 | | 0.14 ... 0.22 | | 0.28 ... 0.4 | |
| Backlash of teeth | mm | 0.3 ... 0.6 | | 0.3 ... 0.6 | | 0.3 ... 0.6 | | | |
| Pinion clearance | mm | 2.0 ... 3.0 | | 2.0 ... 3.0 | | 2.0 ... 3.0 | | | |

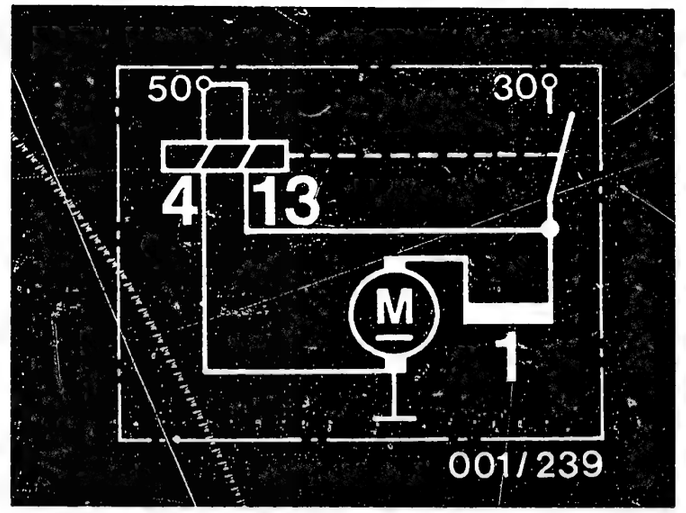
1) 0 001 307 019



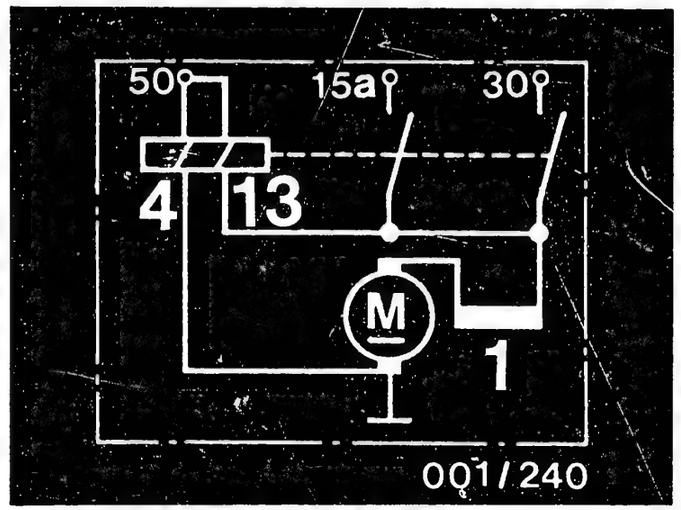

1 = Series winding
4 = Holding winding
13= Pull-in winding

| Part no. | | 0 001 310 .. | | 0 001 311 .. | | 0 001 311 033<br>0 001 311 043 | | 0 001 311 042<br>047<br>050<br>056 | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | GF 6V 0.55 kW | | GF 12 V 1 kW | | GF 12V 1.1 kW | | GF 12V 1.35 kW | |
| Idle | V | 5.5 | | 11.5 | | 11.5 | | 11.5 | |
| | < A | 65 | | 50 | | 50 | | 70 | |
| | > $min^{-1}$ | 4500 | | 5500 | | 5800 | | 7500 | |
| Short circuit | V | 2.5 | 2 | 8.5 | 7.5 | 7 | 6 | 7.5 | 6.5 |
| | A | 290... | 220... | 350... | 310... | 400... | 330... | 480... | 410... |
| | | 370 | 300 | 450 | 400 | 490 | 420 | 560 | 490 |
| Torque | > Nm | 7 | 5.5 | 18 | 16 | 14 | | 12 | 10 |
| Minimum voltage for solenoid switch | V | 3.5 | | 7.5 | | 7.5 | | 8.0 | |
| Commutator dia. | | | | | | | | | |
| new | mm | 35.3 | | 36 | | | | | |
| minimum | mm | 33.5 | | 33.5 | | | | | |
| Brush press | N | 11.5 ... 13.5 | | 11.5 ... 13.5 | | | | | |
| Carbon-brush minimum length | mm | 17 | | 13 | | | | | |
| Setting "a" relay | mm | 19 ± 0.1 | | 19 ± 0.1 | | | | | |
| Burn-off reserve | mm | 0.9 ... 1.5 | | 0.7 ... 1.5 | | | | | |
| Armature longitudinal clearance | mm | 0.5 ... 0.3 | | 0.05 ... 0.3<br>(0.1 ... 0.3) 1) | | | | | |
| Armature braking torque | Nm | 0.25 ... 0.4 | | 0.25 ... 0.4<br>(0.3 ... 0.55) 1) | | | | | |
| Overrunning torque, overrunning clutch | Nm | 0.14 ... 0.22 | | 0.14 ... 0.22 | | | | | |
| Backlash of teeth | mm | 0.3 ... 0.6 | | 0.3 ... 0.6 | | | | | |
| Pinion clearance | mm | 2.0 ... 3.0 | | 2.0 ... 3.0 | | | | | |

1) 0 001 311 042

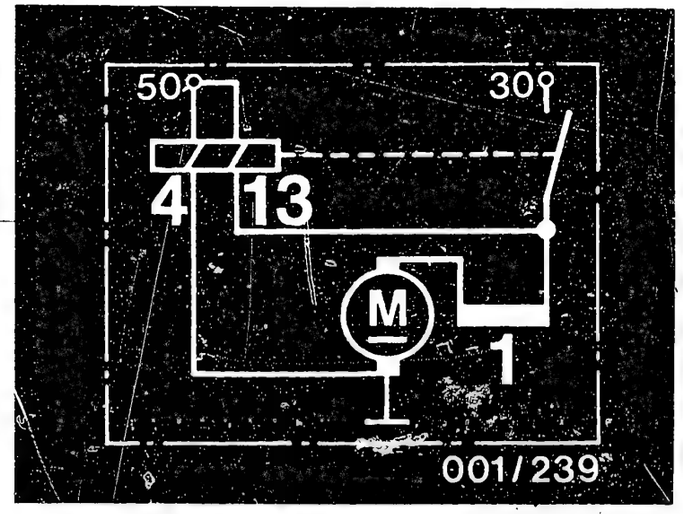



1 = Series winding
4 = Holding winding
13= Pull-in winding

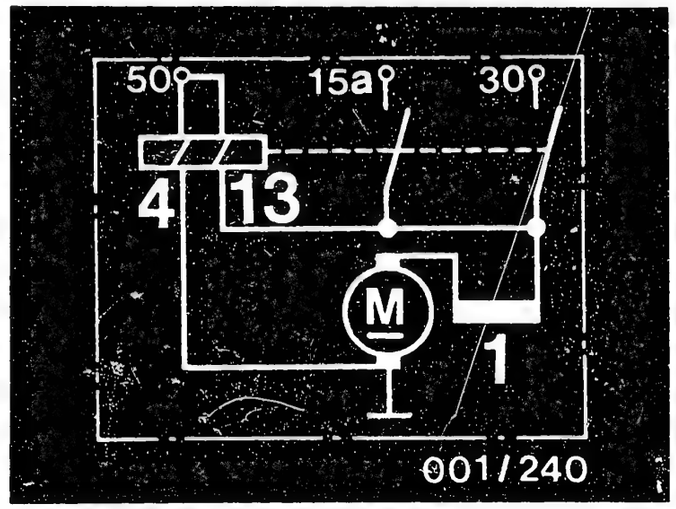


| Part no. | | 0 001 311 1.. | | 0 001 312 .. | | 0 001 312 1.. | | 0 001 313 .. | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | GF 12 V 1.1 kW | | GE 12V 1.5 kW | | GB 12 V 1.5 kW | | GF 12V 1.5 kW | |
| Idle | V | 11.5 | | 11 | | 11.5 | | 11.5 | |
| | < A | 70 | | 115 | | 85 | | 80 | |
| | > $min^{-1}$ | 7500 | | 8500 | | 8500 | | 8000 | |
| Short circuit | V | 7.4 | 6.5 | 5 | 4 | 6 | 5 | 6 | 5 |
| | A | 480...560 | 410...490 | 660...780 | 520...620 | 650...730 | 530...720 | 520...610 | 430...520 |
| Torque | > Nm | 16 | 15 | 15 | 12 | 19 | 16 | 17 | 14.8 |
| Minimum voltage for solenoid switch | V | 8.0 | | 7.5 | | 8.0 | | 7.5 | |
| Commutator dia. | | | | | | | | | |
| | new mm | 36 | | 36 | | | | 36 | |
| | minimum mm | 33.5 | | 33.5 | | | | 33.5 | |
| Brush press. | N | 18 ... 21 | | 18 ... 21 | | (15 ... 17)[1] | | 18 ... 21 | |
| Carbon-brush minimum length | mm | 13 | | 13 | | | | 13 | |
| Setting "a" relay | mm | 28.5 ± 0.2 | | 23 ± 0.15 | | (31 ± 0.2)[1] | | 19 ± 0.1 | |
| Burn-off reserve | mm | 0.8 ... 1.2 | | 0.7 ... 1.5 | | (0.8...1.2)[1] | | 0.7 ... 1.5 | |
| Armature longitudinal clearance | mm | 0.1 ... 0.3 | | 0.1 ... 0.3 | | | | 0.05 ... 0.3 | |
| Armature braking torque | Nm | 0.3 ... 0.55 | | 0.3 ... 0.55 | | | | 0.3 ... 0.55 | |
| Overrunning torque, overrunning clutch | Nm | 0.14 ... 0.22 | | 0.14...0.22 | | (0.18...0.28)[1] | | 0.14 ... 0.22 | |
| Backlash of teeth | mm | 0.3 ... 0.6 | | 0.3 ... 0.6 | | | | 0.3 ... 0.6 | |
| Pinion clearance | mm | 2.0 ... 3.0 | | 2.0 ... 3.0 | | | | 2.0 ... 3.0 | |

1) 0 001 312 104, .. 105

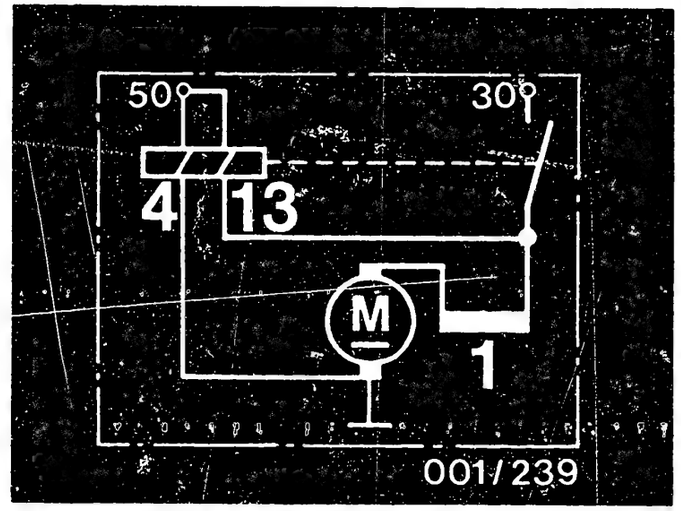



1 = Series winding
4 = Holding winding
13= Pull-in winding

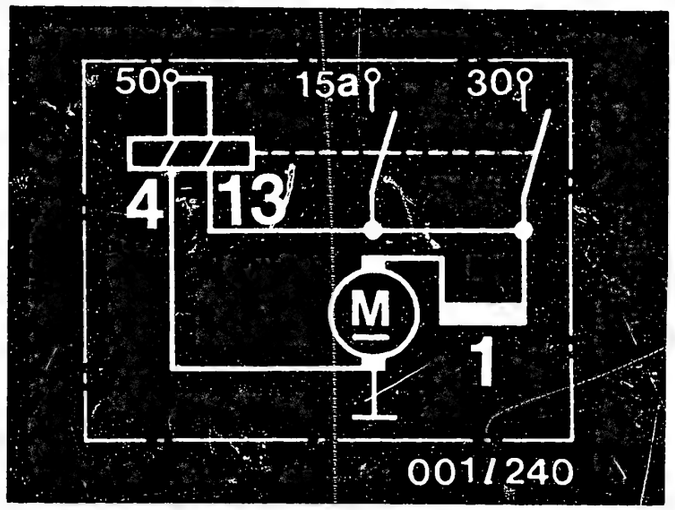


| Part no. | | 0 001 314 .. | | 0 001 315 .. | | 0 001 316 .. 1) | | 0 001 317 .. 1) | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | GF 12V 1.5 kW | | GF 12V 1.9 kW | | GF 24V 1.6 kW | | GF 12V 1.7 kW | |
| Idle | V | 11.5 | | 11 | | 23.5 | | 11.5 | |
| | < A | 80 | | 85 | | 35 | | 80 | |
| | > $min^{-1}$ | 7500 | | 9000 | | 7000 | | 7500 | |
| Short circuit | V | 6 | 5 | 5.5 | 5 | 18 | 19 | 5.5 | 5.0 |
| | A | 690... | 560... | 680... | 610... | 270... | 290... | 700... | 650... |
| | | 780 | 650 | 830 | 750 | 340 | 360 | 820 | 750 |
| Torque | > Nm | 22 | 19 | 17 | 15 | 24 | 25 | 22 | 20 |
| Minimum voltage for solenoid switch | V | 7.5 | | 7.5 | | 17.5 | | 7.5 | |
| Commutator dia. | | | | | | | | | |
| | new mm | 36 | | 36 | | 36 | | 35.3 | |
| | minimum mm | 33.5 | | 33.5 | | 33.5 | | 33.5 | |
| Brush press. | N | 18 ... 21 | | 11.5 ... 13.5 | | 18 ... 21 | | 16 ... 21 | |
| Carbon-brush minimum length | mm | 13 | | 13 | | 13 | | 10 | |
| Setting "a" relay | mm | 19 ± 0.1 | | 19 ± 0.1 | | - | | - | |
| Burn-off reserve | mm | 0.7 ... 1.5 | | 0.7 ... 1.5 | | 0.7 ... 1.5 | | - | |
| Armature longitudinal clearance | mm | 0.05 ... 0.3 | | 0.05 ... 0.3 | | 0.05 ... 0.3 | | 0.05 ... 0.3 | |
| Armature braking torque | Nm | 0.3 ... 0.55 | | 0.3 ... 0.55 | | 0.3 ... 0.55 | | 0.3 ... 0.6 | |
| Overrunning torque, overrunning clutch | Nm | 0.14...0.22 (0.22...0.28) 2) | | 0.14...0.22 | | 0.14 ... 0.22 | | 0.18 ... 0.26 | |
| Backlash of teeth | mm | 0.3 ... 0.6 | | 0.3 ... 0.6 | | 0.3 ... 0.6 | | 0.3 ... 0.6 | |
| Pinion clearance | mm | 2.0 ... 3.0 | | 2.0 ... 3.0 | | 2.0 ... 3.0 | | 2.0 ... 3.0 | |

1) Test with 10 mΩ series resistor (connection term. 30/2 with test bench EFAL 152/153) or separate 10 mΩ series resistor
2) Overrunning torque increased as of April 1979

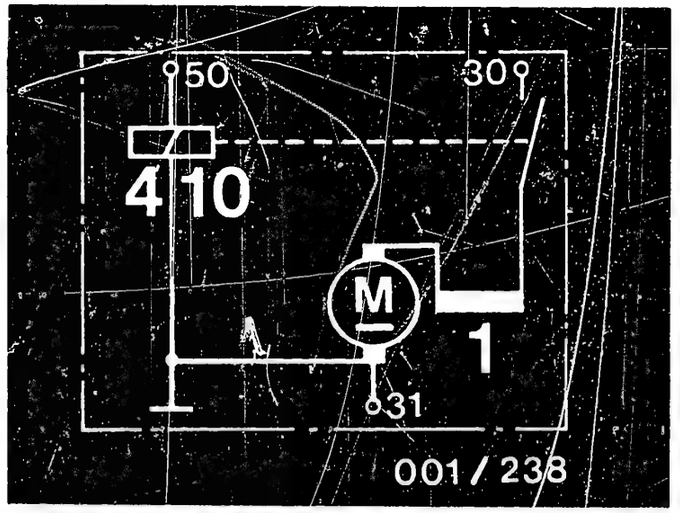



1 = Series winding
4 = Holding winding
13= Pull-in winding

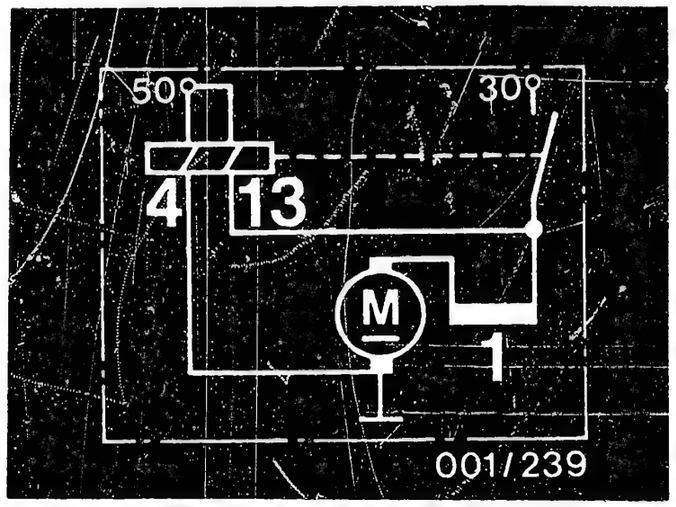


| Part no. | | 0 001 354 .. | | 0 001 355 .. | | 0 001 356 .. | | 0 001 358 .. | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | JD 12V 1.8 kW | | JD 24V 2 kW | | JB 12V 1.8 kW | | JD 12V 2.3 kW | |
| Idle | V | 11.5 | | 23.5 | | 11.5 | | 11.5 | |
| | < A | 90 | | 45 | | 90 | | 90 | |
| | > $min^{-1}$ | 5000 | | 6000 | | 5000 | | 6000 | |
| Short circuit | V | 6.5 | 5.5 | 18 | 17 | 6.5 | 5.5 | 5.5 | 4.5 |
| | A | 580... 800 | 480... 700 | 420... 520 | 410... 510 | 680... 830 | 580... 730 | 610... 760 | 480... 630 |
| Torque | > Nm | 37 | 33 | 41 | 39 | 34 | 29 | 44 | 37 |
| Minimum voltage for solenoid switch | V | 8 | | 17 | | 8 | | 8 | |
| Commutator dia. new | mm | 42 | | 42 | | 42 | | 42 | |
| minimum | mm | 39.5 | | 39.5 | | 39.5 | | 39.5 | |
| Brush press. | N | 10.5 ... 13.5 | | 10.5 ... 13.5 | | 10 ... 13 | | 10 ... 13 | |
| Carbon-brush minimum length | mm | 15.5 | | 15.5 | | 15.5 | | 15.5 | |
| Setting "a" relay | mm | 34 ± 0.2 (49 ± 0.2)[1] | | 34 ± 0.2 (35 ± 0.2)[3] | | - | | 52.7 ± 0.2 | |
| Burn-off reserve | mm | 1.0 ... 2.0 | | 1.0 ... 2.0 | | 1.0 ... 1.6 | | 1.0 ... 2.0 | |
| Armature longitudinal clearance | mm | 0.1 ... 0.3 | | 0.1 ... 0.3 | | 0.1 ... 0.3 | | 0.1 ... 0.3 | |
| Armature braking torque | Nm | 0.45...0.75 | | (0.45...0.6)[3] 0.45...0.75 | | 0.45...0.6 | | 0.6 ... 0.8 | |
| Overrunning torque, overrunning clutch | Nm | 0.07...0.08 (0.26...0.32)[2] | | 0.07...0.08 0.26...0.32 [2] | | 0.2 ... 0.3 | | 0.26...0.32 | |
| Backlash of teeth | mm | 0.3 ... 0.6 | | 0.3 ... 0.6 | | 0.35...0.6 | | 0.35...0.6 | |
| Pinion clearance | mm | 2.0 ... 3.0 | | 2.0 ... 3.0 | | 2.5 ... 4.0 | | 2.5 ... 4.0 | |

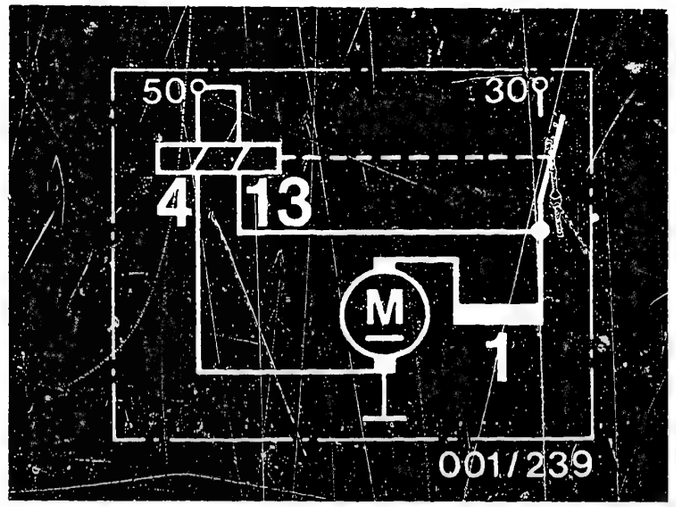
1) 0 001 354 031
2) Overrrunning torque increased as of April 1979
3) 0 001 355 003



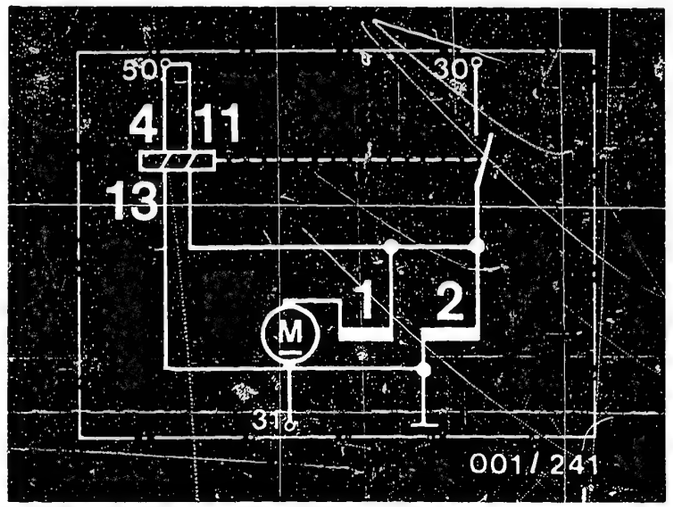

1 = Series winding
4 = Holding winding
10= Solenoid switch
13= Pull-in winding



| Part no. | | 0 001 358 2.. | | 0 001 359 .. | | from 0 001 359 050 | | 0 001 360 .. | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | JD 12V 2.5 kW | | JD 12V 3 kW | | JD 12V 3 kW | | JD 24V 4 kW | |
| Idle | V | 11 | | 11.5 | | 11 | | 23.5 | |
| | < A | 120 | | 90 | | 130 | | 50 | |
| | > $min^{-1}$ | 8000 | | 4800 | | 7500 | | 5500 | |
| Short circuit | V | 4.5 | 4.0 | 4.0 | 3.5 | 4.0 | 3.5 | 14 | 13 |
| | A | 870... | 770... | 760... | 650... | 850... | 730... | 950... | 850... |
| | | 1070 | 970 | 900 | 800 | 1050 | 930 | 1100 | 1000 |
| Torque | > Nm | 34 | 29 | 45 | 38 | 45 | 38 | 60 | 45 |
| Minimum voltage for solenoid switch | V | 8 | | 8 | | 8 | | 18 | |
| Commutator dia. | | | | | | | | | |
| | new mm | 42 | | 45 | | | | 42 | |
| | minimum mm | 39.5 | | 42.5 | | | | 39.5 | |
| Brush press. | N | 26 ... 28 | | 36 ... 38 | | | | 26 ... 28 | |
| Carbon-brush minimum length | mm | 15.5 | | 15.5 | | | | 15.5 | |
| Setting "a" relay | mm | - | | - | | | | - | |
| Burn-off reserve | mm | 1.2 ... 1.5 | | 1.0 ... 2.0 | | | | 1.0 ... 2.0 | |
| Armature longitudinal clearance | mm | 0.1 ... 0.3 | | 0.1 ... 0.3 | | | | 0.1 ... 0.3 | |
| Armature braking torque | Nm | 0.8 ... 1.2 | | 0.45 ... 0.75 | | | | 0.4 ... 0.55 | |
| Overrunning torque, overrunning clutch | Nm | 0.45 ... 0.7 | | 0.4 ... 0.55 | | | | 0.4 ... 0.55 | |
| Backlash of teeth | mm | 0.4 ... 0.6 | | 0.35... 0.6 | | | | 0.35... 0.6 | |
| Pinion clearance | mm | 2.5 ... 4.0 | | 2.5 ... 4.0 | | | | 2.5 ... 4.0 | |



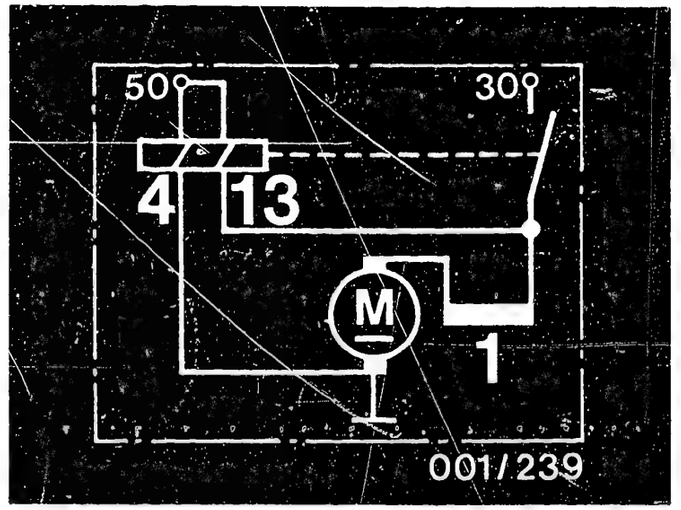

1 = Series winding
2 = Shunt winding
4 = Holding winding
11= Control relay
13= Pull-in winding



| Part no. | | as of 0 001 360 026 | | 0 001 362 .. | | 0 001 362 3.. 362 6.. | | 0 001 363 .. | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | JD 24V 4 kW | | JF 12V 2.0 kW 2.4 kW | | JF 12V 2.7 kW 2.3 kW | | JF 24V 3.0 kW 3.2 kW | |
| Idle | V | 23 | | 11.5 | | 11.5 | | 23.5 | |
| | < A | 85 | | 95 | | 125 | | 60 | |
| | > $min^{-1}$ | 7500 | | 6500 | | 7000 | | 6200 | |
| Short circuit | V | 14 | 13 | 4.5 | 3.5 | 4.5 | 3.5 | 15.5 | 14.5 |
| | A | 900... 1100 | 800... 1000 | 700... 880 | 530... 700 | 850... 1000 | 750... 900 | 630... 750 | 580... 700 |
| Torque | > Nm | 68 | 60 | 34 | 26 | 35 | 30 | 56 | 45 |
| Minimum voltage for solenoid switch | V | 18 | | 7.5 | | 7.5 | | 18 | |
| Commutator dia. | | | | | | | | | |
| | new mm | 42 | | 42(45)[1] | | 45 | | 42(45)[1] | |
| | minimum mm | 39.5 | | 39.5(42.5)[1] | | 42.5 | | 39.5 (42.5)[1] | |
| Brush press. | N | 26 ... 28 | | 11.5 ... 13 (23 ... 25)[2] | | 23 ... 25 | | 11.5 ... 13 (23 ... 25)[2] | |
| Carbon-brush minimum length | mm | 15.5 | | 15.5 8.5 [2] | | 8.5 | | 15.5 (8.5)[2] | |
| Setting "a" relay | mm | - | | - | | - | | - | |
| Burn-off reserve | mm | 1.0 ... 2.0 | | 1.0 ... 2.0 | | 1.0 ... 2.0 | | 0.7 ... 1,3 | |
| Armature longitudinal clearance | mm | 0.1 ... 0.3 | | 0.1 ... 0.3 | | 0.1 ... 0.4 | | 0.1 ... 0.3 | |
| Armature braking torque | Nm | 0.4 ... 0.55 | | 0.45...0.75 | | 0.45...0.75 | | 0.45 ... 0.75 | |
| Overrunning torque, overrunning clutch | Nm | 0.4 ... 0.55 | | 0.4 ... 0.55 | | 0.4 ... 0.65 | | 0.35 ...0.65 | |
| Backlash of teeth | mm | 0.35 ... 0.6 | | 0.4 ... 0.7 | | 0.4 ... 0.7 | | 0.4 ... 0.7 | |
| Pinion clearance | mm | 2.5 ... 4.0 | | 2.5 ... 4.0 | | 2.5 ... 4.0 | | 2.5 ... 4.0 | |

1) As of FD (date of manufacture) 921/922

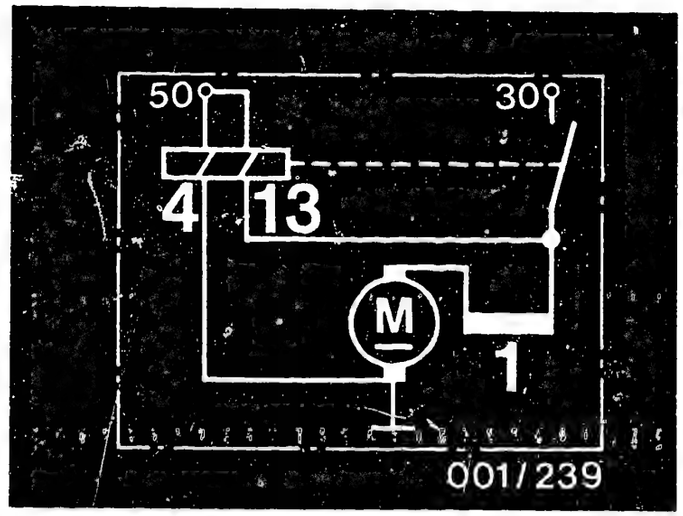
2) With tubular brush holder



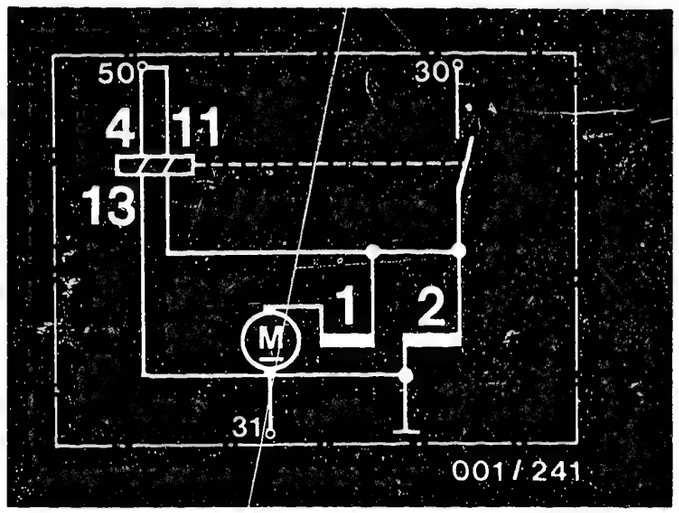

1 = Series winding
4 = Holding winding
13= Pull-in winding

| Part no. | | 0 001 364 .. | 0 001 364 1.. 364 2.. | 0 001 365 ..[1] | 0 001 366 .. |
|---|---|---|---|---|---|
| Previous type code | | JD 24V 4.6 kW | JD 24V 4.8 kW | JD 12V 3.7 kW | JF 12V 1.9 kW |
| Idle | V | 23 | 23 | 11.4 | 11.5 |
| | < A | 95 | 85 | 120 | 95 |
| | > $min^{-1}$ | 6500 | 6500 | 5500 | 6500 |
| Short circuit | V | 8.5 \| 7.5 | 12 \| 11 | 5.6 \| 4.5 | 5.5 |
| | A | 1070... 1250 \| 940... 1100 | 970... 1170 \| 870... 1070 | 1450... 1650 \| 1150... 1340 | 720...880 |
| Torque | > Nm | 58 \| 52 | 70 \| 60 | 52 \| 48 | 39 |
| Minimum voltage for solenoid switch | V | 15 | 18 | 8 | 8 |
| Commutator dia. | | | | | |
| | new mm | 42 | 42 | 45 | 42.1 |
| | minimum mm | 39.5 | 39.5 | 42.5 | 39.5 |
| Brush press. | N | 26 ... 28 | 26 ... 28 | 26 ... 38 | - |
| Carbon-brush minimum length | mm | 15.5 | 15.5 | 15.5 | 15.5 |
| Setting "a" relay | mm | 34 ± 0.1 | - | - | - |
| Burn-off reserve | mm | 1.0 ... 2.0 | 0.7 ... 1.3 | 0.7 ... 1.3 | 0.7 ... 1.3 |
| Armature longitudinal clearance | mm | 0.1 ... 0.3 | 0.1 ... 0.3 | 0.1 ... 0.4 | 0.1 ... 0.3 |
| Armature braking torque | Nm | - | 0.5 ... 1.2 | 0.5 ... 1.2 | 0.45 ... 0.75 |
| Overrunning torque, overrunning clutch | Nm | 0.45 ... 0.55 | 0.35 ... 0.65 | 0.35 ... 0.65 | 0.4 ... 0.65 |
| Backlash of teeth | mm | 0.3 ... 0.6 | 0.4 ... 0.7 | 0.4 ... 0.7 | 0.4 ... 0.7 |
| Pinion clearance | mm | 2.5 ... 4.0 | 2.5 ... 4.0 | 2.5 ... 4.0 | 2.5 ... 4.0 |

1) Testing with batteries in parallel connection

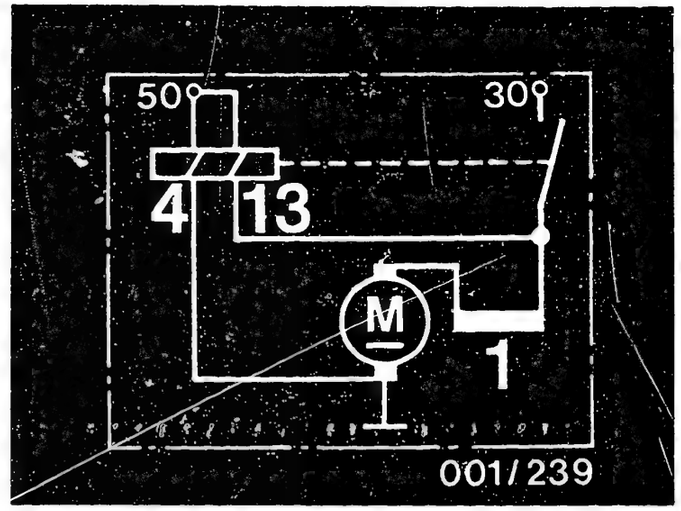



1 = Series winding
2 = Shunt winding
4 = Holding winding
11= Control relay
13= Pull-in winding



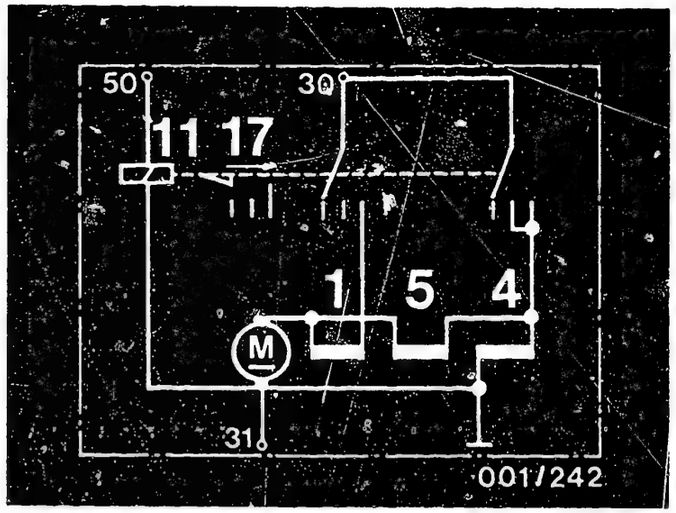
| Part no. | | 0 001 367 .. [1] | 0 001 368 .. |
|---|---|---|---|
| Previous type code | | JF 12V 3 kW | JF 24V 4 kW |
| Idle | V | 11.5 | 23 |
| | < A | 130 | 85 |
| | > $min^{-1}$ | 7000 | 7000 |
| Short circuit | V | 7.2 | 13.5 |
| | A | 1150...1300 | 900...1050 |
| Torque | > Nm | 57 | 65 |
| Minimum voltage for solenoid switch | V | 8 | 18 |
| Commutator dia. | | | |
| | new mm | 45 | 45 |
| | minimum mm | 42.5 | 42.5 |
| Brush press. | N | - | - |
| Carbon-brush minimum length | mm | 15.5 | 15.5 |
| Setting "a" relay | mm | - | - |
| Burn-off reserve | mm | 0.7 ... 1.3 | 0.7 ... 1.3 |
| Armature longitudinal clearance | mm | 0.1 ... 0.3 | 0.1 ... 0.3 |
| Armature braking torque | Nm | 0.5 ... 1.2 | 0.5 ... 1.2 |
| Overrunning torque | Nm | 0.35 ... 0.65 | 0.35 ... 0.65 |
| Backlash of teeth | mm | 0.4 ... 0.7 | 0.4 ... 0.7 |
| Pinion clearance | mm | 2.5 ... 4.0 | 2.5 ... 4.0 |

1) Test with parallel-connected batteries

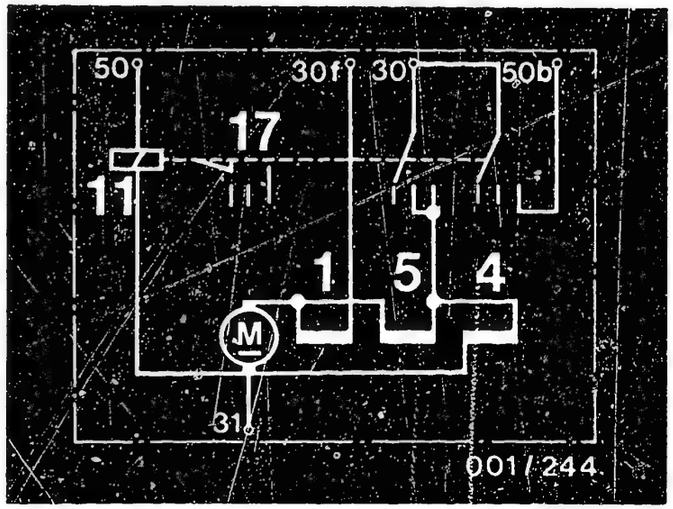



1 = Series winding
4 = Holding winding
13= Pull-in winding

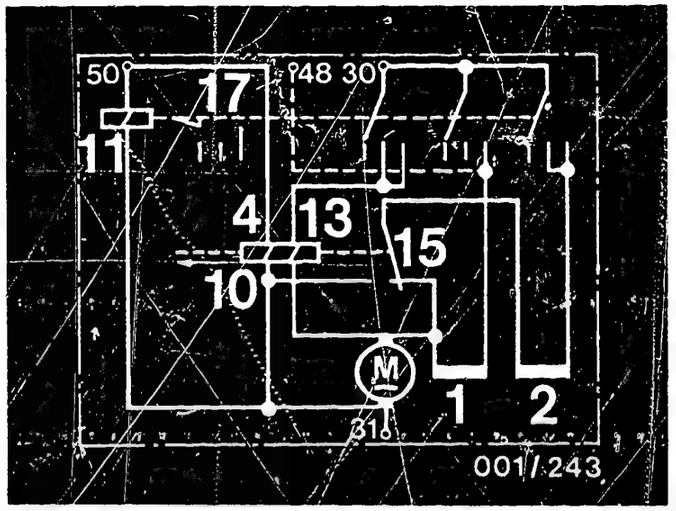
| Part no. | | 0 001 400 .. | | 0 001 401 .. | | 0 001 402 .. | |
|---|---|---|---|---|---|---|---|
| Previous type code | | BNG 2.5/12 | | KG 12V 4 kW | | KG 24V 4 kW | |
| Idle | V | 11 | | 10.5 | | 23 | |
| | < A | 120 | | 160 | | 95 | |
| | > $min^{-1}$ | 2000 | | 3000 | | 3100 | |
| Short circuit | V | 5 | 4 | 3.5 | 3 | 13 | 12 |
| | A | 740... | 560... | 830... | 700... | 900... | 840... |
| | | 890 | 720 | 1040 | 900 | 1100 | 1040 |
| Torque | > Nm | 55 | 49 | 47 | 42 | 65 | 60 |
| Minimum voltage for solenoid switch | V | 8 | | 8 | | 15 | |
| Commutator dia. | | | | | | | |
| new | mm | 48 | | 48 | | 48 | |
| minimum | mm | 45 | | 45 | | 45 | |
| Brush press | N | 12 ... 15 | | 12 ... 15 | | 12 ... 15 | |
| Carbon-brush minimum length | mm | 11 | | 11 | | 17.5 | |
| Tripping "b" relay | mm | 12.0 ... 14.8 | | 12.0 ... 14.8 | | 12.0 ... 14.8 | |
| Armature travel longitudinal clearance | mm | 24 ... 26 | | 24 ... 26 | | 24 ... 26 | |
| Longitudinal clearance for pinion | mm | 0.5 ... 2.5 | | 0.5 ... 3.0 | | 0.5 ... 3.0 | |
| Armature-return spring | mm | 38 ... 42 | | 38 ... 42 | | 38 ... 42 | |
| Multi-plate clutch | | | | | | | |
| Overrunning torque | Nm | 0.75 ... 1.05 | | 0.75 ... 1.05 | | 0.75 ... 1.05 | |
| Initial stage | Nm | 0.4 ... 0.6 | | 0.4 ... 0.6 | | 0.4 ... 0.6 | |
| Slip torque | Nm | 120 ... 150 | | 130 ... 150 | | 130 ... 150 | |
| Backlash of teeth | mm | 0.6 ... 0.8 | | 0.6 ... 0.8 | | 0.6 ... 0.8 | |
| Pinion clearance | mm | 3.0 ... 4.0 | | 3.0 ... 4.0 | | 3.0 ... 4.0 | |



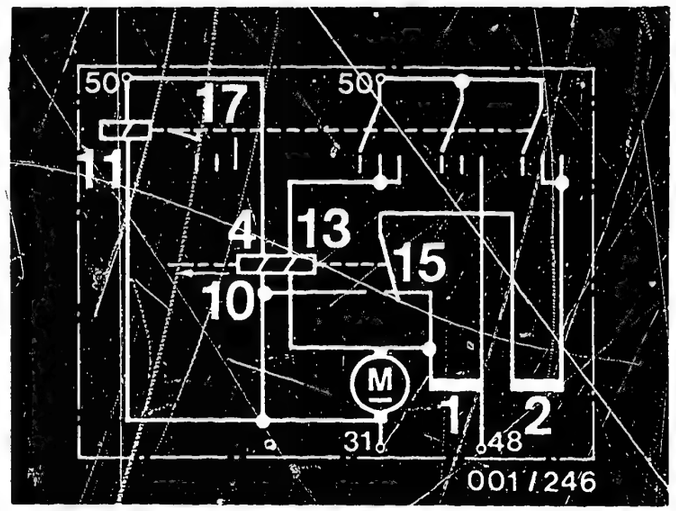

1 = Series winding
4 = Holding winding
5 = Auxiliary winding
11= Control relay
17= Tripping lever



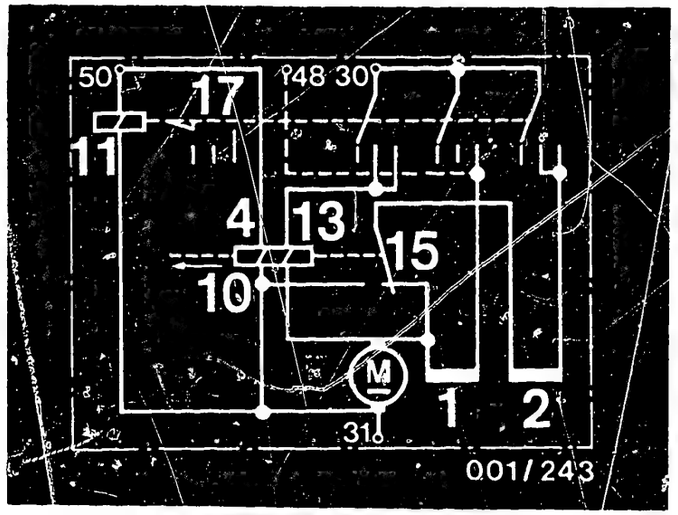
| Part no. | | 0 001 410 .. | | 0 001 410 057 .. 068 | | 0 001 411 .. | | 0 001 412 .. | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | KB 24V 5.5 kW | | KG 24V 5.5 kW | | KB 24V 6.5 kW | | KB 24V 6.5 kW | |
| Idle | V | 23 | | 23.5 | | 23 | | 23 | |
| | < A | 115 | | 105 | | 95 | | 85 | |
| | > $min^{-1}$ | 3700 | | 3500 | | 3900 | | 3000 | |
| Short circuit | V | 8.5 | 7.5 | 9 | 8 | 8 | 7 | 9.5 | 8.5 |
| | A | 1220...1400 | 1080...1270 | 1120...1290 | 1000...1160 | 1260...1430 | 1120..1270 | 1200...1400 | 1050..1250 |
| Torque | > Nm | 76 | 67 | 87 | 77 | 88 | 76 | 94 | 84 |
| Minimum voltage for solenoid switch | V | 15 | | | | 15 | | 15 | |
| Commutator dia. | | | | | | | | | |
| new | mm | 50 | | | | 50 | | 50 | |
| minimum | mm | 47 | | | | 47 | | 47 | |
| Brush press. | N | 24 ... 29 | | | | 24 ... 29 | | 24 ... 29 | |
| Carbon-brush minimum length | mm | 17.5 | | | | 17.5 | | 17.5 | |
| Armature longitudinal clearance | mm | 0.2 ... 0.6 | | | | 0.2 ... 0.6 | | 0.2 ... 0.6 | |
| Longitudinal clearance for drive spindle | mm | 0.3 | | | | 0.3 | | 0.3 | |
| Return spring for pinion and solenoid switch | N | 35 ... 45 | | | | 35 ... 45 | | 35 ... 45 | |
| Initial and final pressure | N | 50 ... 70 | | | | 60 ... 70 | | 60 ... 70 | |
| Multi-plate clutch Overrunning torque | Nm | 0.2 ... 0.4 | | | | 0.2 ... 0.4 | | 0.3 .. 0.5 | |
| Slip torque | Nm | 160 ... 200 | | | | 160 ... 200 | | 160 ... 200 | |
| Backlash of teeth | mm | 0.7 ... 0.9 | | | | 0.6 ... 1.0 | | 0.6 ... 0,9 | |
| Pinion clearance | mm | 3.0 ... 4.0 | | | | 3.0 ... 4.0 | | 3.0 ... 4.0 | |



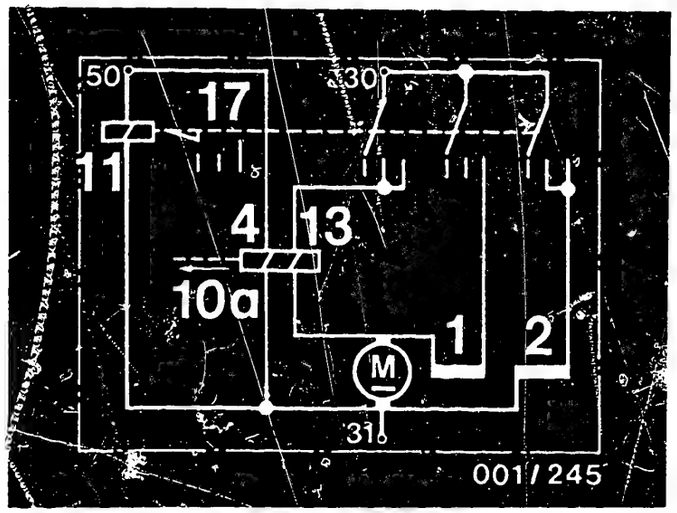

1 = Series winding
2 = Shunt winding
4 = Holding winding
10= Solenoid switch
11= Control relay
13= Pull-in winding
15= Change-over contact (break-before-make)
17= Tripping lever



| Part no. | | 0 001 413 .. | 0 001 414 .. | 0 001 415 .. | 0 001 416 .. | |
|---|---|---|---|---|---|---|
| Previous type code | | KB 12V 3.5 kW | KG 24V 4.5 kW | KB 24V 5 kW | KB 24V 5.4 kW | |
| Idle | V | 11 | 23 | 23 | 23 | |
| | < A | 160 | 95 | 95 | 120 | |
| | > $min^{-1}$ | 3600 | 4000 | 4000 | 5000 | |
| Short circuit | V | 5.3 | 10.5 | 10.3 | 12 | 11 |
| | A | 1500 ... 1680 | 1050 ... 1200 | 1100 ... 1250 | 1680... 1800 | 1550... 1650 |
| Torque | > Nm | 40 | 62 | 65 | 98 | 88 |
| Minimum voltage for solenoid switch | V | 8 | 15 | 15 | 15 | |
| Commutator dia. new | mm | 50 | | | | |
| Commutator dia. minimum | mm | 48 | | | | |
| Brush press. | N | 24 ... 29 | | | | |
| Carbon-brush minimum length | mm | 17.5 | | | | |
| Armature longitudinal clearance | mm | 0.2 ... 0.6 | | | | |
| Longitudinal clearance for drive spindle | mm | 0.3 | | | | |
| Return spring for pinion and solenoid switch | N | 35 ... 45 | | | | |
| Initial and final pressure | N | 60 ... 70 | | | | |
| Multi-plate clutch Overrunning torque | Nm | 0.2 ... 0.4 | | | | |
| Slip torque | Nm | 160 ... 200 | | | | |
| Backlash of teeth | mm | 0.6 ... 0.9 | | | | |
| Pinion clearance | mm | 3.0 ... 4.0 | | | | |

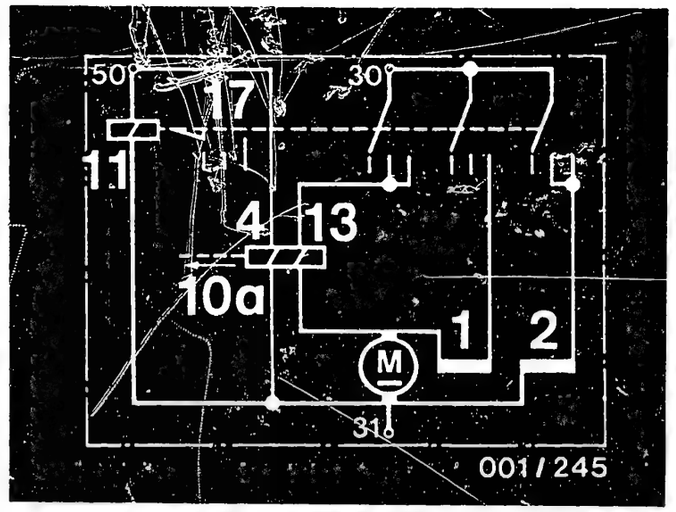



1 = Series winding
2 = Shunt winding
4 = Holding winding
10 = Solenoid switch
10a= Starting-motor solenoid
11 = Control relay
13 = Pull-in winding
15 = Change-over contact (break-before make)
17 = Tripping lever

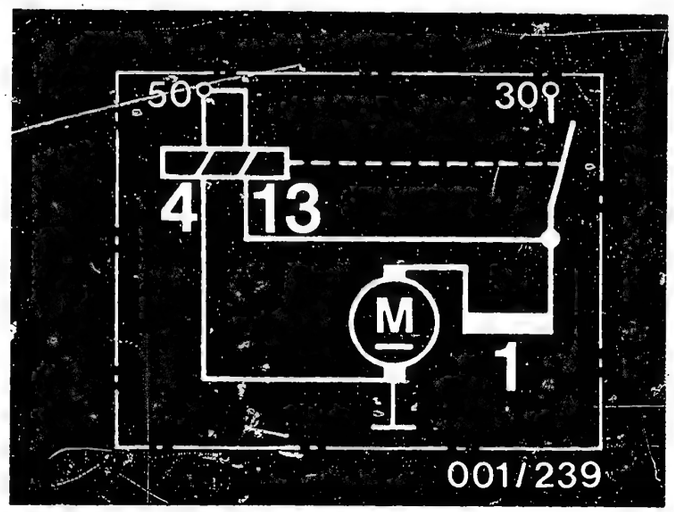


| Part no. | | 0 001 417 .. | | 0 001 418 .. | | 0 001 420 .. | 0 001 421 .. | |
|---|---|---|---|---|---|---|---|---|
| Previous type code | | KB 24V 6.6 kW | | KB 12V 3.6 kW | | KE 24V 7.5 kW | KE 12V 5.5 kW | |
| Idle | V | 23 | | 11 | | 24 | 12 | |
| | < A | 120 | | 220 | | 140 | 200 | |
| | > $min^{-1}$ | 4000 | | 4200 | | 5500 | 5500 | |
| Short circuit | V | 12 | 11 | 5 | 4.5 | 9 | 4,0 | 4,5 |
| | A | 1630...1750 | 1480...1600 | 1800...1950 | 1500...1650 | <1400 | <1900 | <2050 |
| Torque | > Nm | 110 | 100 | 45 | 35 | 110 | 75 | 90 |
| Minimum voltage for solenoid switch | V | 15 | | 8 | | 16 | 8 | |
| Commutator dia. | | | | | | | | |
| new | mm | 50 | | | | 50 | | |
| minimum | mm | 48 | | | | 48 | | |
| Brush press. | N | 24 ... 29 | | | | 47 ... 53 | | |
| Carbon-brush minimum length | mm | 17.5 | | | | 17.5 | | |
| Armature longitudinal clearance | mm | 0.2 ... 0.6 | | | | 0.1...0.4[1] | 0.1...0.3[2] | |
| Longitudinal clearance for drive spindle | mm | 0.3 | | | | - | | |
| Return spring for pinion and solenoid switch | N | 35 ... 45 | | | | - | | |
| Initial and final pressure | N | 60 ... 70 | | | | - | | |
| Multi-plate clutch Overrunning torque | Nm | 0.2 ... 0.4 | | | | - | | |
| Slip torque | Nm | 160 ... 200 | | | | | | |
| Backlash of teeth | mm | 0.6 ... 0.9 | | | | 0.6 ... 0.9 | | |
| Pinion clearance | mm | 3.0 ... 4.0 | | | | 3.0 ... 4.0 | | |
| Setting "a" relay | mm | | | | | + 0.2<br>62.5 - 0.5 | | |

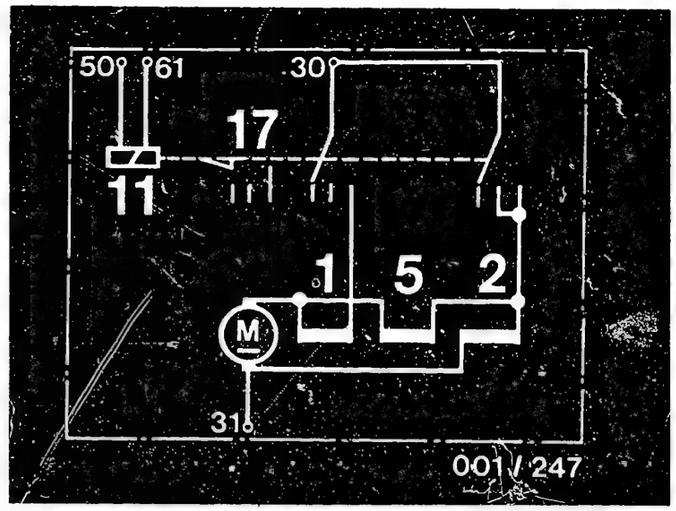
1) Without screw plug
2) With screw plug



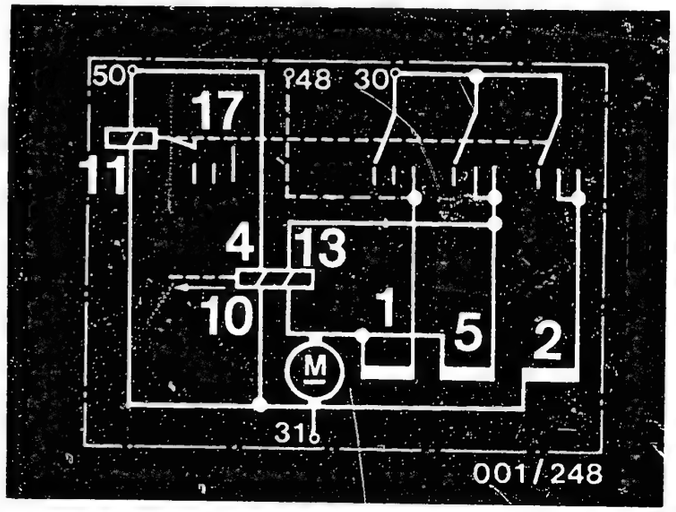

1 = Series winding
2 = Shunt winding
4 = Holding winding
10a= Starting-motor solenoid
11 = Control relay
13 = Pull-in winding
17 = Tripping lever



| Part no. | | 0 001 500 .. | | 0 001 501 .. | | 0 001 510 .. | |
|---|---|---|---|---|---|---|---|
| Previous type code | | QD 12V 3 kW | | QD 24V 6 kW | | QB 24V 9 kW | |
| Idle | V | 11 | | 22.5 | | 23 | |
| | < A | 130 | | 115 | | 105 | |
| | > $min^{-1}$ | 1200 | | 3800 | | 4200 | |
| Short circuit | V | 4 | 3 | 8 | 7 | 6 | 5 |
| | A | 740... 920 | 530... 710 | 1350... 1530 | 1170... 1350 | 1480... 1700 | 1220... 1400 |
| Torque | > Nm | 75 | 62 | 80 | 70 | 85 | 70 |
| Minimum voltage for solenoid switch | V | 8 | | 15 | | 13 | |
| Commutator dia. | | | | | | | |
| new | mm | 62 | | 62 | | 62 | |
| minimum | mm | 59 | | 59 | | 59 | |
| Brush press. | N | 14 ... 16 | | 14 ... 16 | | 20 ... 22 | |
| Carbon-brush minimum length | mm | 17.5 | | 17.5 | | 17.5 | |
| Armature longitudinal clearance | mm | 24 ... 26 | | 24 ... 26 | | - | |
| Longitudinal clearance for pinion | mm | 0.3 | | 0.3 | | - | |
| Armature longitudinal clearance | mm | - | | - | | 0.2 ... 0.3 | |
| Longitudinal clearance for drive spindle | mm | - | | - | | 0.3 | |
| Armature-return spring | N | 50 | | 50 | | - | |
| Initial and final pressure | N | 67 | | 72 | | - | |




1 = Series winding
2 = Shunt winding
4 = Holding winding
5 = Auxiliary winding
10 = Solenoid switch
11 = Control relay
13 = Pull-in winding
17 = Tripping lever

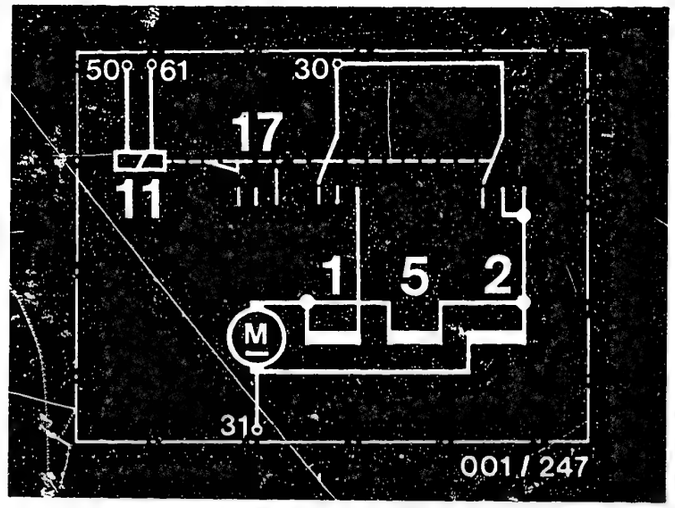



Continued on C5/C6

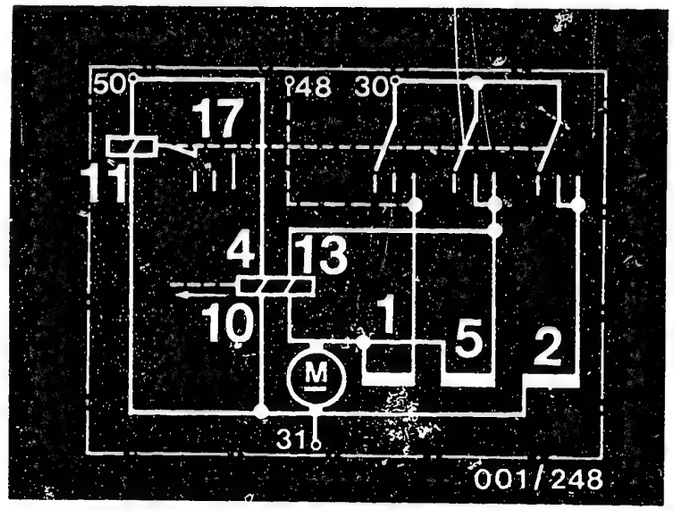
Continuation of C3/C4

| | | | | |
|---|---|---|---|---|
| Part No. | | 0 001 500 .. | 0 000 501 .. | 0 001 510 |
| Previous type code | | QD 12V 3kW | QD 24V 6 kW | QB 24V 9 kW |
| Return spring for pinion and solenoid switch | N | - | - | 35 ... 45 |
| Initial and final pressure | N | - | - | 66 ... 70 |
| Tripping "b" relay | mm | 15.8 ... 18.4 | 15.8 ... 18.4 | - |
| Multi-plate clutch Overrunning torque | Nm | 0.75 ... 1.05 | 0.75 ... 1.05 | 0.3 ... 0.5 |
| Initial stage | Nm | 0.6 ... 0.8 | 0.6 ... 0.8 | - |
| Slip torque | Nm | 140 ... 160 | 140 ... 160 | 180 ... 220 (200 ... 240) 1) |
| Backlash of teeth | mm | 0.6 ... 0.8 | 0.6 ... 0.8 | 0.7 ... 0.9 |
| Pinion clearance | mm | 3.0 ... 4.0 | 3.0 ... 4.0 | 3.0 ... 4.0 |

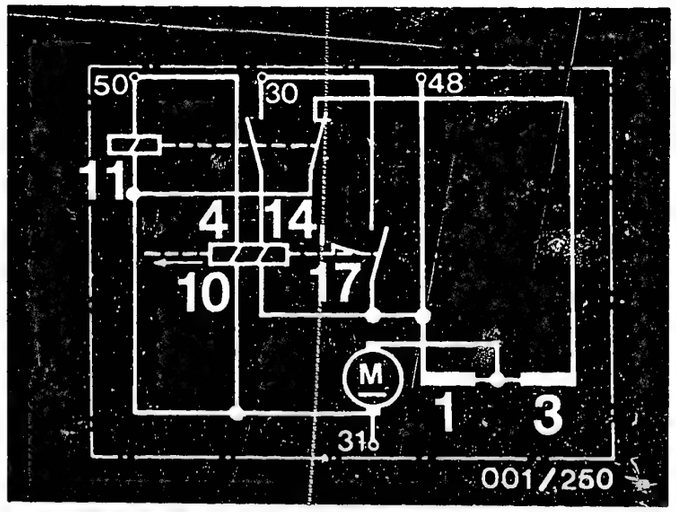
1) As of FD 822/823

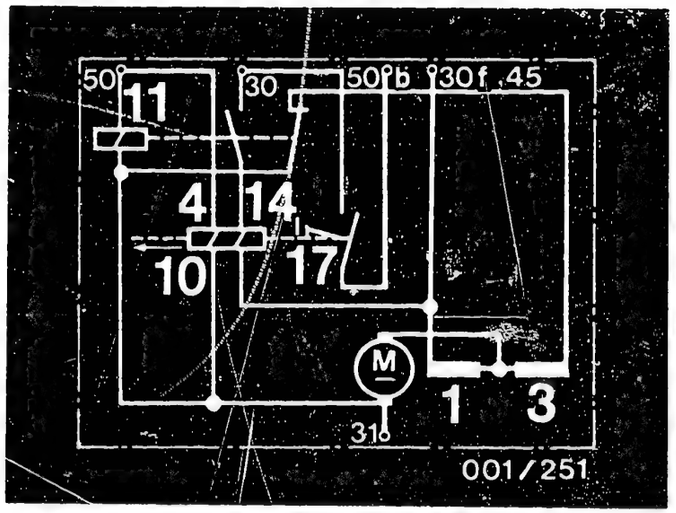


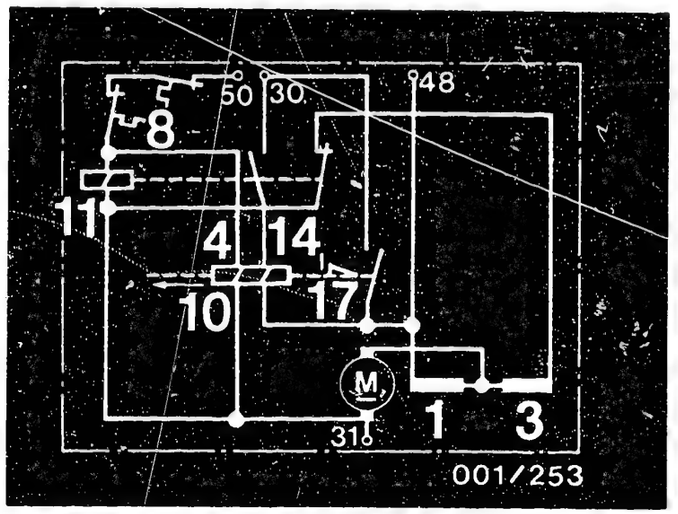

1 = Series winding
2 = Shunt winding
4 = Holding winding
5 = Auxiliary winding
10 = Solenoid switch
11 = Control relay
13 = Pull-in winding
17 = Tripping lever



| Part no. | | 0 001 600 .. | | 0 001 601 .. | | 0 001 602 001 | | 0 001 602 002 | |
|---|---|---|---|---|---|---|---|---|---|
| Previous type code | | TB 24V 10 kW | | TB 24V 15 kW | | TE 24V 10 kW | | TE 24V 10 kW | |
| Idle | V | 22.5 | | 22.5 | | 22.5 | | 22.5 | |
| | < A | 115 | | 170 | | 115 | | 115 | |
| | > $min^{-1}$ | 6000 | | 6000 | | 4100 | | 4800 | |
| Short circuit | V | 8 | 7 | 5 | 4.5 | 8 | 7 | 8 | 7 |
| | A | 1400... 1570 | 1200... 1380 | 1700... 1910 | 1510... 1730 | 1400... 1590 | 1220.. 1400 | 1400... 1590 | 1220... 1400 |
| Torque | > Nm | 133 | 177 | 155 | 140 | 205 | 180 | 185 | 160 |
| Minimum voltage for solenoid switch | V | 14 | | 12 | | 14 | | 14 | |
| Commutator dia. new | mm | 80 | | | | | | | |
| minimum | mm | 77 | | | | | | | |
| Brush press. | N | 13 ... 16 | | | | | | | |
| Carbon-brush minimum length | mm | 17 | | | | | | | |
| Armature longitudinal clearance | mm | 0.2 ... 0.4 | | | | | | | |
| Longitudinal clearance for drive spindle | mm | 0.5 ... 1.3 | | | | | | | |
| Return spring for pinion and solenoid switch | N | 70 ... 90 | | | | | | | |
| Initial and final pressure | N | 110 ... 130 | | | | | | | |
| Multi-plate clutch Overrunning torque | Nm | 0.6 ... 1.0 | | | | | | | |
| Slip torque | Nm | 300 ... 420 | | | | | | | |
| Backlash of teeth | mm | 0.7 ... 0.9 | | | | | | | |
| Pinion clearance | mm | 3.0 ... 4.5 | | | | | | | |



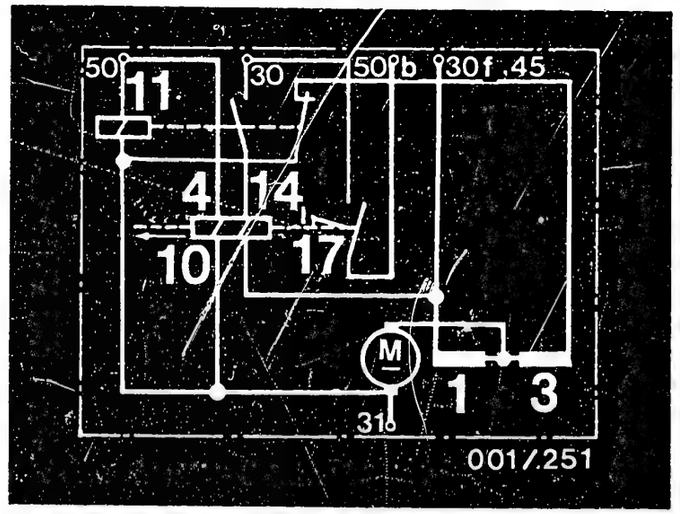



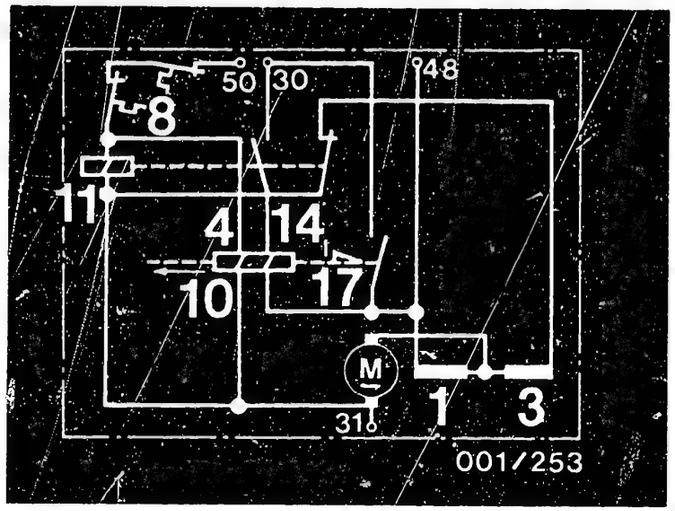

Legend for diagrams

1 = Series winding
3 = Brake winding
4 = Holding winding
8 = Thermo-switch
10 = Solenoid switch
11 = Control relay
14 = Pull-in and opposing winding
17 = Tripping lever

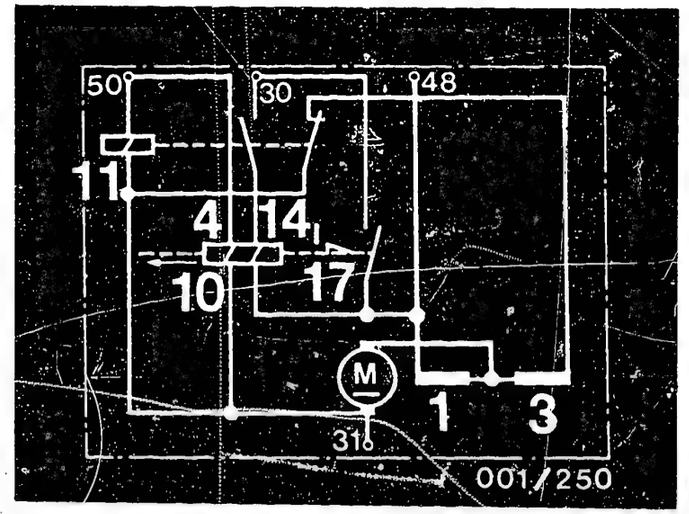
| Part no. | | 0 001 603 001 | 0 001 603 .. | 0 001 608 .. | 0 001 608 001 |
|---|---|---|---|---|---|
| Previous type code | | TE 24V 15 kW | TE 24V 15 kW | TF 24V 15 kW | TF 24V 15 kW |
| Idle | V | 22 | 22 | 23 | 23 |
| | < A | 170 | 170 | 140 | 170 |
| | > $min^{-1}$ | 5800 | 4200 | 3700 | 3500 |
| Short circuit | V | 5 \| 4.5 | 5 \| 4.5 | 5 \| 4.5 | 5 \| 4.5 |
| | A | 1700... \| 1510... | 1700... \| 1510... | 1700... \| 1610... | 1700... \| 1610... |
| | | 1910 \| 1730 | 1910 \| 1730 | 1920 \| 1730 | 1910 \| 1730 |
| Torque | > Nm | 145 \| 130 | 145 \| 130 | 140 \| 126 | 140 \| 126 |
| Minimum voltage for solenoid switch | V | 14 | 14 | 12 | 12 |
| Commutator dia. | | | | | |
| new | mm | 80 | | 80 | 80 |
| minimum | mm | 77 | | 77 | 77 |
| Brush press. | N | 13 ... 16 | | 13 ... 16 | 13 ... 16 |
| Carbon-brush minimum length | mm | 17 | | 17 | 17 |
| Armature longitudinal clearance | mm | 0.2 ... 0.4 | | 0.2 ... 0.4 | 0.2 ... 0.4 |
| Longitudinal clearance for drive spindle | mm | 0.5 ... 1.3 | | 0.5 ... 1.3 | 0.5 ... 1.3 |
| Return spring for pinion and solenoid switch | N | 70 ... 90 | | 70 ... 90 | 70 ... 90 |
| Initial and final pressure | N | 110 ... 130 | | 110 ... 130 | 110 ... 130 |
| Multi-plate clutch Overrunning torque | Nm | 0.6 ... 1.0 | | 0.6 ... 1.0 | 0.8 ... 1.8 |
| Slip torque | Nm | 300 ... 420 | | 320 ... 420 | 320 ... 420 |
| Backlash of teeth | mm | 0.7 ... 0.9 | | 0.7 ... 0.9 | 0.7 ... 0.9 |
| Pinion clearance | mm | 3.0 ... 4.0 | | 3.0 ... 4.0 | 3.0 ... 4.0 |

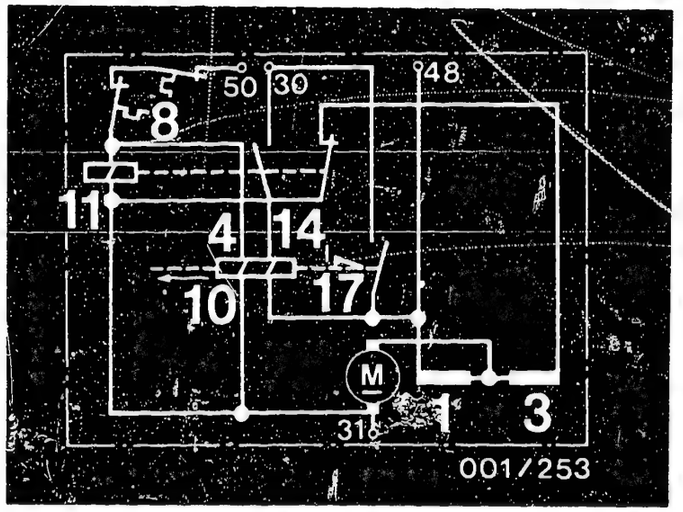


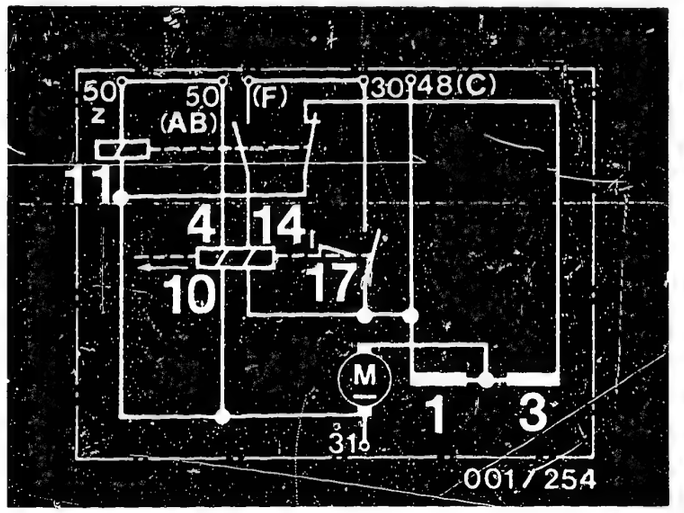

1 = Series winding
3 = Brake winding
4 = Holding winding
8 = Thermo-switch
10 = Solenoid switch
11 = Control relay
14 = Pull-in and opposing winding
17 = Tripping lever



| Part no. | | 0 001 608 002<br>... 003<br>... 005 | 0 001 608 004<br>.. 006<br>.. 007 | 0001 611 .. | 0 001 613 .. |
|---|---|---|---|---|---|
| Previous type code | | TF 24V 15 kW | TF 24V 15 kW | TF 24V 10 kW | TF 24V 18 kW |
| Idle | V | 23 | 23 | 23 | 23 |
| | < A | 140 | 140 | 130 | 210 |
| | > $min^{-1}$ | 3700 | 6000 | 4000 | 4900 |
| Short circuit | V | 5 \| 4.5 | 5 \| 4.5 | 8 \| 7 | 9 |
| | A | 1680... \| 1500...<br>1880 \| 1700 | 1700... \| 1530...<br>1900 \| 1730 | 1380... \| 1200...<br>1580 \| 1400 | < 3300 |
| Torque | > Nm | 225 \| 200 | 146 \| 130 | 195 \| 170 | 280 |
| Minimum voltage for solenoid switch | V | 12 | 12 | 13 | 13 |
| Commutator dia. | | | | | |
| new | mm | 80 | | 80 | 80 |
| minimum | mm | 77 | | 77 | 77 |
| Brush press. | N | 13 ... 16 | | 13 ... 16 | 14 ... 15 |
| Carbon-brush minimum length | mm | 17 | | 17 | 17 |
| Armature longitudinal clearance | mm | 0.2 ... 0.4 | | 0.2 ... 0.4 | 0.2 ... 0.4 |
| Longitudinal clearance for drive spindle | mm | 0.5 ... 1.3 | | 0.5 ... 1.3 | 0.5 ... 1.3 |
| Return spring for pinion and solenoid switch | N | 70 ... 90 | | 70 ... 90 | 70 ... 90 |
| Initial and final pressure | N | 110 ... 130 | | 110 ... 130 | 110 ... 130 |



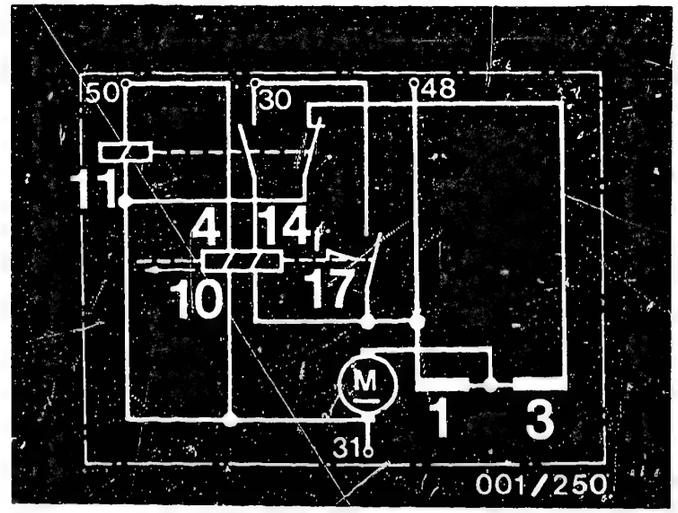



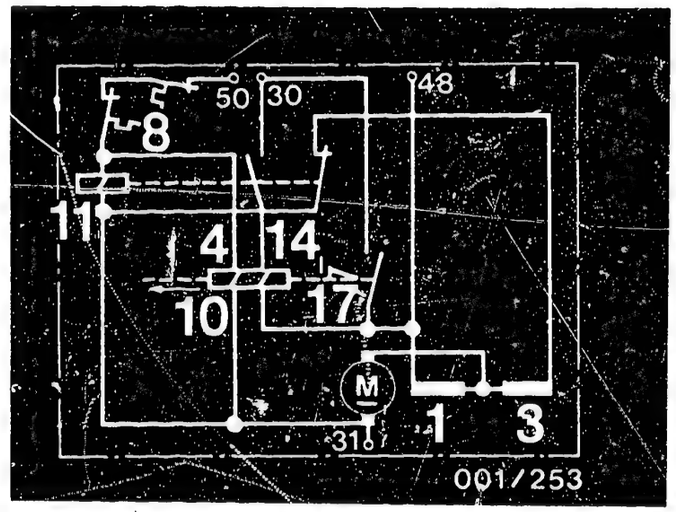

Continued on C13/C14

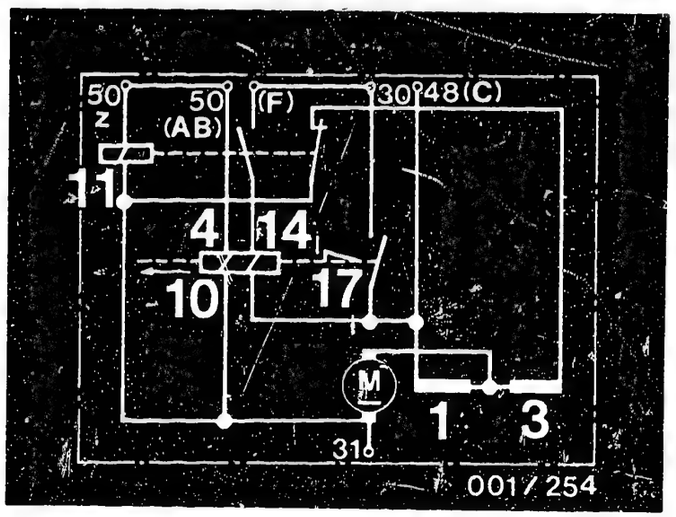
Continuation of C11/12

| Part No. | | 0 001 608 002 ... 003 ... 005 | 0 001 608 004 ... 006 ... 007 | 0 001 611 .. | 0 001 613.. |
|---|---|---|---|---|---|
| Previous type code | | TF 24V 15 kW | TF 24V 15 kW | TF 24V 10 kW | TF 24V 18 kW |
| Multi-plate clutch Overrunning torque | Nm | 0.6 ... 1.0 | | 0.6 ... 1.0 (0.8 ... 1.0) 1) | 0.6 ... 1.0 |
| Slip torque | Nm | 320 ... 420 | | 320 ... 420 | 420 ... 500 |
| Backlash of teeth | mm | 0.7 ... 0.9 | | 0.7 ... 0.9 | 0.7 ... 0.9 |
| Pinion clearance | mm | 3.0 ... 4.0 | | 3.0 ... 4.0 | 3.0 ... 4.0 |

1) With built-in drive



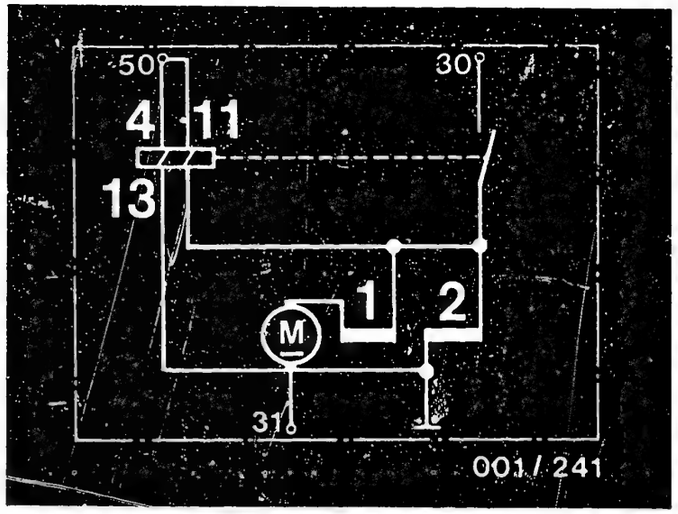




Legends for diagrams

1 = Series winding
3 = Break winding
4 = Holding winding
8 = Thermo-switch
10 = Solenoid switch
11 = Control relay
14 = Pull-in and opposing winding
17 = Tripping lever

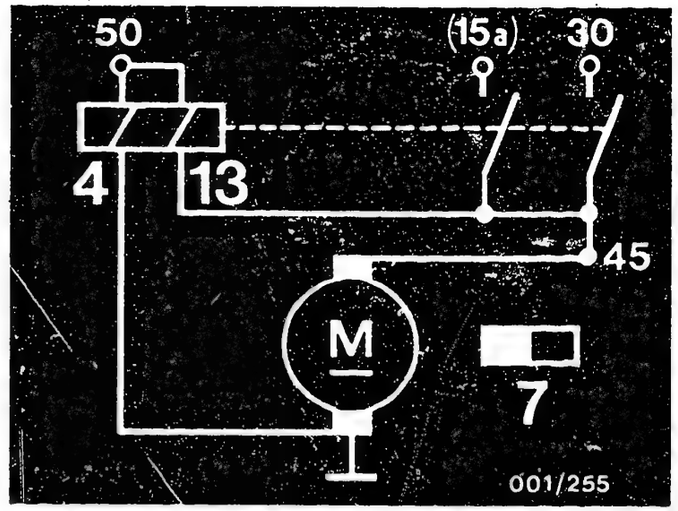
| Part no. | | 0 001 370 .. 1) | | 0 001 371 .. | |
|---|---|---|---|---|---|
| Previous type code | | JE 12V 5.5 kW | | JE 24V | |
| Idle | V | 11.5 | | 23,5 | |
| | < A | 280 | | 150 | |
| | > $min^{-1}$ | 6500 | | 6500 | |
| Short circuit | V | 4.5 | 5.0 | 11 | 10 |
| | A | <2200 | <2400 | < 1800 | <1650 |
| Torque | > Nm | 54 | 60 | 100 | 85 |
| Minimum voltage for solenoid switch | V | 8 | | 16 | |
| Commutator dia. | | | | | |
| new | mm | 45 | | | |
| minimum | mm | 42.5 | | | |
| Brush press. | N | 47 ... 53 | | | |
| Carbon-brush minimum length | mm | 17.5 | | | |
| Armature longitudinal clearance | mm | 0.1 ... 0.4 | | | |
| Backlash of teeth | mm | 0.6 ... 0.9 | | | |
| Pinion clearance | mm | 2.5 ... 4.0 | | | |

1) Testing with parallel-connected batteries




1 = Series winding
2 = Shunt winding
4 = Holding winding
11= Pull-in winding
13 = Solenoid switch

| Part no. | | 0 001 111 .. | 0 001 112 .. | | 0 001 113 .. | | 0 001 114 .. | |
|---|---|---|---|---|---|---|---|---|
| Previous type code | | DW24V1.6 kW | DM12V0.9kW | | DM12V0.8kW | | DM2V1.0kW | |
| Idle | V | 23 | 11.5 | | 11.5 | | 11.4 | |
| | < A | 40 | 45 | | 45 | | 50 | |
| | > $min^{-1}$ | 2800 | 5500 | | 5000 | | 5000 | |
| Short circuit | V | 12 [1] | 14 [1] | 5.7 [2] | 6.7 [2] | 5.7 [2] | 6.7 [2] | 5.2 [2] | 6.2 [2] |
| | A | 450... 550 | 550... 650 | 350... 450 | 400... 500 | 350... 450 | 400... 500 | 400... 500 | 450... 550 |
| Torque | > Nm | 25 | 28 | 7.0 | 8.0 | 6.0 | 7.0 | 7.5 | 8.5 |
| Minimum voltage for solenoid switch | V | 18 | | 8 [3] 7.3 [4] | | 8 [3] 7.3 [4] | | 8 [3] 7.3 [4] | |
| Commutator dia. | | | | | | | | | |
| new | mm | 32.3 | | | 35.0 | | | | |
| minimum | mm | 31.2 | | | 33.5 | | | | |
| Brush press. | N | - | | | - | | | | |
| Carbon-brush minimum length | mm | 4.5 | | | 3.0 | | | | |
| Armature longitudinal clearance | mm | 0.05 - 0.4 | | | 0.05 - 0.4 | | | | |
| Armature braking torque | Nm | 0.9 - 1.4 | | | 0.3 . 0.4 | | | | |
| Overrunning torque, Overrunning clutch | Nm | 0.12 - 0.18 | | | 0.12 - 0.18 | | | | |
| Backlash of teeth | mm | 0.3 - 0.6 | | | 0.3 - 0.6 | | | | |
| Pinion clearance | mm | 2.0 - 3.0 | | | 2.0 - 3.0 | | | | |




2 = Solenoid switch
3 = Permanent magnets
4 = Holding winding
13 = Pull-in winding

1) Testing with 2 x 143 Ah in series with 10 mΩ series resistor
2) Testing with 2 x 143 Ah parallel with 10 mΩ series resistor (EFAL 152/153 connection 30/2)
3) Test specification for relay 0 331 303 505, .. 563
4) Test specification for relay 0 331 302 553, .. 559

Note:
Do not operate 12 V starting motor (DW) with 24 V, as this will destroy the starting motor.

## Table of contents

Table of contents (continued)

| Starting-motor part number: | Coordinates |
|---|---|
| 0 001 204 .. | A 14 |
| 205 .. | A 14 |
| 206 .. | A 14 |
| 207 .. | A 14 |
| 208 .. | A 16 |
| 209 .. | A 16 |
| 211 .. | A 18 |
| 212 .. | A 20 |
| 213 .. | A 20 |
| 214 .. | A 20 |
| 215 .. | A 22 |
| 218 .. | A 22 |
| 304 .. | A 22 |
| 305 .. | A 22 |
| 306 .. | B 1 |
| 307 .. | B 1 |
| 308 .. | B 1 |
| 310 .. | B 3 |
| 311 .. | B 3 |
| 311 1.. | B 5 |
| 312 .. | B 5 |
| 313 .. | B 5 |

Table of contents (continued)

| Starting-motor part number: | Coordinates |
|---|---|
| 0 001 314 .. | B 7 |
| 315 .. | B 7 |
| 316 .. | B 7 |
| 317 .. | B 7 |
| 354 .. | B 9 |
| 355 .. | B 9 |
| 356 .. | B 9 |
| 358 .. | B 9 |
| 358 2.. | B 11 |
| 359 .. | B 11 |
| 360 .. | B 11 |
| 360 026 | B 13 |
| 362 .. | B 13 |
| 363 .. | B 13 |
| 364 .. | B 15 |
| 365 .. | B 15 |
| 366 .. | B 15 |
| 367 .. | B 17 |
| 368 .. | B 17 |
| 370 .. | C 15 |
| 371 .. | C 15 |
| 400 .. | B 19 |
| 401 .. | B 19 |
| 402 .. | B 19 |

Table of contents (continued)

| Starting-motor part number: | Coordinates |
|---|---|
| 0 001 410 .. | B 21 |
| 411 .. | B 21 |
| 412 .. | B 21 |
| 413 .. | B 23 |
| 414 .. | B 23 |
| 416 .. | B 23 |
| 417 .. | C 1 |
| 418 .. | C 1 |
| 420 .. | C 1 |
| 421 .. | C 1 |
| 500 .. | C 3 |
| 501 .. | C 3 |
| 510 .. | C 3 |
| 600 .. | C 7 |
| 601 .. | C 7 |
| 602 .. | C 7 |
| 603 .. | C 9 |
| 608 .. | C 9 |
| 608 .. | C 11 |
| 611 .. | C 11 |
| 613 .. | C 11 |

Published by: After-Sales Service Department for Training and Technology (KH/VSK). Press date: 4.1988

Please direct questions and comments concerning the contents to our authorized representative in your country.
This publication is intended solely for the use of the Bosch After-Sales Service Organization, and may not be passed on to third parties without our consent.

Microfilmed in the Federal Republic of Germany. Micro-photographié en République Fédérale d'Allemagne.